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COMPUTERWORLD FOCUS

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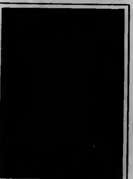

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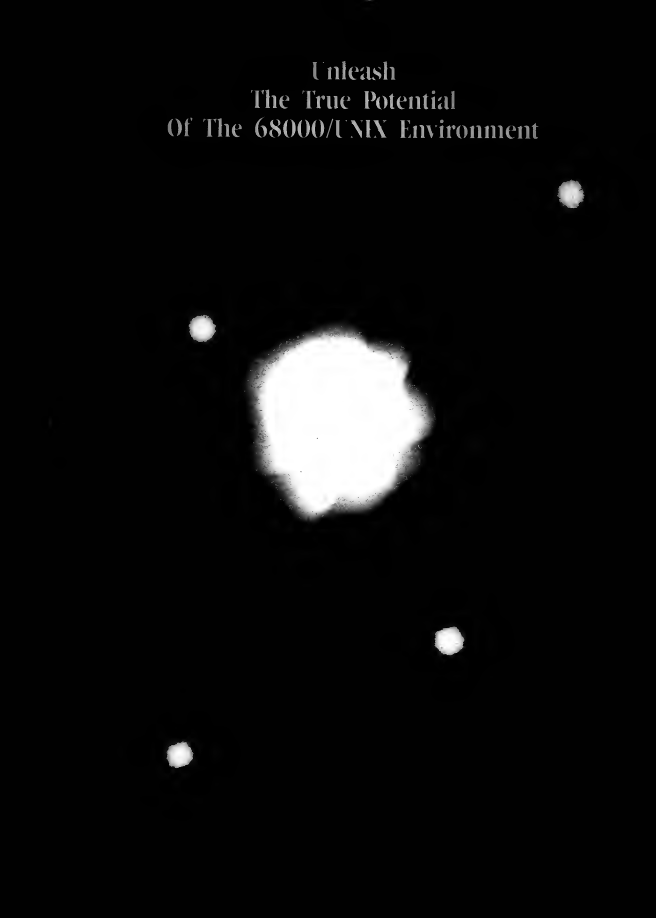
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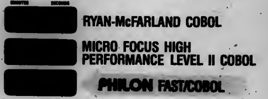

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Editorial

A Clear Focus

Not since the personal computer first swept into organizations has a subject generated such controversy and debate. Will Unix become a standard operating system or won't it? Is it really the long-awaited solution for system portability or will a lack of commercial software make it unfeasible for businesses? And, above all, how is IBM going to react?

Unix has been simmering in the technology pot for some time; now that it has come to a boil, no one is sure whether to turn the heat up or off. A unanimous rally to Unix is probably not going to occur in management information systems (MIS) or end-user installations, at least not until more of the pieces are in place. Nevertheless, the popularity and potential of Unix continue to increase on a dramatic scale. Interest in Unix has escalated, and the time is fast approaching to see if that interest turns into utilization.

In the interim, MIS planners once again face a future without clear-cut answers. At the time when planners are charged with spreading computing power throughout their organizations, the technology is becoming more puzzling in terms of what direction it will take and when and where the products will arrive.

MIS managers are finding it difficult to cope with the technologies, products, directions and organizational changes and they are looking for answers from many areas. Information overload has become a real problem.

Computerworld Focus intends to ease information overload by providing you with tightly integrated packages of information about topics that are important to you. Throughout the year we are going to put the hottest issues of the day in focus for you. We won't give you bulk raw data; rather, we'll provide you with tightly written analyses. We hope to give you a perspective that will raise the right questions and, if it doesn't provide all the answers, will at least guide your thinking along the right paths. Throughout this year we will be devoting entire issues to topics that you deal with daily, such as office automation, microcomputer software, business graphics, application software, manufacturing, networking, systems software and microcomputer hardware. We will be analyzing and assessing products, technologies, issues and future directions to help you sort out the best course for you and your organization.

Because our job is to help you in your job, we want to shape *Computerworld Focus* according to your needs and requirements. Please let us know what you think of *Computerworld Focus* and how we can keep improving it to help you even more. Your comments and suggestions will be welcomed throughout the year.

Best of luck in the new year and stay in touch.

Insider

Unix Perspectives

By Tom Willmott

Throughout the course of their research subscriptions, clients call International Data Corp. (IDC) to request information on various subjects ranging from microcomputer software to the installed base of Control Data Corp. Cyber series processors, from local-area networks to programmer productivity. Each year, literally thousands of questions are asked and successfully answered. Nevertheless, in 1981 just four of these questions were related to the Unix operating system. In 1982, the number was nine. In 1983, the total jumped to 40. In 1984, more than 120 requests came in for information on Unix, triple the previous year.

Six issues seem to recur among these questions. Each is explored briefly in the following paragraphs.

- The central focus of the year-long surge in Unix' popularity as a discussion topic has been "portability." Unix is designed in such a way that only 30% or 40% of the operating system is hardware dependent. Unlike other operating systems, Unix may be moved from one vendor's machine to another or from micro to mini to mainframe, in most cases by changing less than half of the program.

Make no mistake, changing half an operating system is a nontrivial problem. But if "porting" Unix from machine to machine is at least imaginable, moving IBM MVS to a Honeywell, Inc. architecture or Data General Corp.'s AOS to a Digital Equipment Corp. VAX is unthinkable. Proprietary operating systems have always been inflexibly intertwined with the vendor's proprietary hardware designs.

Some proponents argue that Unix is the ultimate solution for end users facing two serious problems: multivendor hardware environments and applications backlogs. They reason that Unix' portability will eventually solve the problems of having different kinds of computers running the same applications software with a minimum of retrofitting. They also reason that the plethora of utility software available to programmers in a Unix environment will speed applications development.

- In some cases, Unix is already an unqualified success. DP shops across the U.S. and Canada have leveraged Unix strengths into increased productivity. We have seen the development of sophisticated communication gateway programs including menu-driven user interfaces with Unix. This development took place on a DEC VAX 750 in a matter of two months rather than the 10 or 12 months it might have taken using other operating system tools and methodologies.

Although we will not contend that Unix is destined to become the operating system standard of the late 1980s, pragmatic supporters will argue that a Unix programming environment decreases development time for particular kinds of applications, especially those which are unique to an organization or for which sections of code may already exist in a Unix library. The fact that Unix also has the potential to be used across different types of equipment makes it attractive to systems people who need a measure of flexibility. The question is not whether Unix will inherit the earth, but whether Unix can be helpful in my data center today.

- For information systems departments searching for an off-the-shelf solution to the applications backlog, the reality of the marketplace has been and continues to be that independent packaged software for the Unix operating system is scarce. Although the trade magazines write each month of an avalanche of business applications packages just ahead, the practical matter is that VM, DOS/VSE, MVS, VMS, AOS, Primos or any other operating system shop will have a choice of a dozen or more accounting or inventory packages. The Unix enthusiast is lucky to select from one or two. Because mainline business data centers have rarely run Unix, financially successful software houses have rarely written for it.

- In the next nine to 18 months, decision-support applications (micro-mini-based) and communications gateways are the most likely applications to be developed by Unix independents. In most large organizations, office automation applications are plagued by multiple vendors. Second-generation integrated office software is already being written in the C language for Unix. Furthermore, AT&T is clearly positioning itself for decision support and gateway communications processing. With AT&T as its primary vendor champion and inherent strength in the development of unique systems, Unix looks like a good bet outside the data center for end-user computing. And with evidence that Amdahl Corp.'s version of Unix supports a powerful time-sharing environment, the data center may not be off limits either.

- Unix has its roots in the development lab and the university computer room — both places where the favorite

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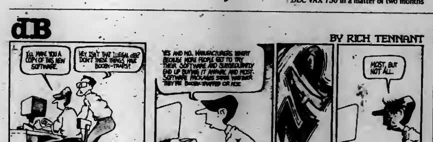
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Q&A

Palantir Corp. of Santa Clara, Calif., is a small Silicon Valley startup company currently developing a compound document processor that extracts both image and text under certain formats and transfers it to a host system. To create the technology, Palantir had to design custom microchips for the software development. The company turned to a Unix-based system to complete the task. Mike Florio, vice-president of marketing, was director and president of the Unix /usr/ group for the past four years.* Computerworld Focus *talked to Florio about the role of Unix in the development and work environments at Palantir.

How does Unix fit into the development of the processor?

The proliferation of tools available with Unix is invaluable. We use Unix tools under the C programming language, but we also use all the other tools available in the Unix system as a way to manage a major software development project.

In addition, some excellent tools for technical development, which run under Unix and are available on a lot of Unix workstations, are coming out of the universities and research areas and are being used for chip design.

Was portability a key issue?

Yes. The ability to move data back and forth between special-purpose machines in a consistent way was instrumental in our being able to get this project done.

What version of Unix are you using?

We're using several versions, including Berkeley 4.2, System V and System III. We've got an IBM Personal Computer running Xenix and an Onyx running System III. We have access to an Arete running System V, and we've got a dozen Sun Microsystems running Berkeley 4.2.

What led you toward Unix?

It was driven from in house. Some in-house people who had had experience with Unix in prior organizations heavily influenced the choice. They insisted that we use it.

You've talked about Unix in the development area. Have you tried to port it into commercial or end-user environments at all?

We are also trying to run a business here, so everybody in the company has at least one terminal here and also at home. Even our secretaries, receptionists and office managers have one at home, and they all use Unix. We had all heard that you can't teach a secretary to use *vi* and *nroff* [Unix features] to create documents. That's malarkey. After about one or two tries on a simple editor, most people figure out how to use *nroff* and insist on using it.

So you've made it user-friendly for the office environment?

We haven't changed a thing. It's just that our people were more willing to jump in and play around with it and find out it wasn't the ogre lots of people thought it was. The first time I showed our office manager *nroff* and *vi*, she said "Come on, you can't really expect me to use that?" Now she's a pro, and it's just been a couple of months.

All of our communications on the terminals, our memo traffic, are on the system using Unix. I don't even know how to use the internal switchboard operation on the phone here. We just mail things to one another — all through Unix.

Was it a problem getting support for Unix?

It would be a problem if we hadn't had the expertise in-house. We're made up of a bunch of computer scientists and physicists, people out of Cal Tech and Stanford. If we were a small company in a small location it would be tough to learn it.

Based on your knowledge of what Unix can do, does it have the potential to spread to commercial environments?

Yes. It's got functions and capabilities that are essential for productivity in those environments. Those capabilities significantly outweigh the perceived drawbacks.

I have a theory. Industry consultants make their money by selling information services to people who don't know what's going on. I think there's been a concerted effort on the part of a lot of industry consultants to inject a lot of confusion in the marketplace about Unix. Then someone will go out and hire them to come in and unconfuse them.

Unix is a partionalist process management, multiuser, multitasking operating system. If you want to run transparently in a network environment, your need those features. If you want windows and all those things, that is all built into Unix. It's always been there.

The problem is that it's much easier to write an application like the blister-pack applications sold in computer stores for single-thread, single-user operating systems. In most cases, those applications violate all the rules of systems programming we've learned over the last 15 years. Consequently, those applications don't port easily to Unix because Unix enforces all those rules.

If people were conscious of the true virtues of Unix would there be a lot more application software out there?

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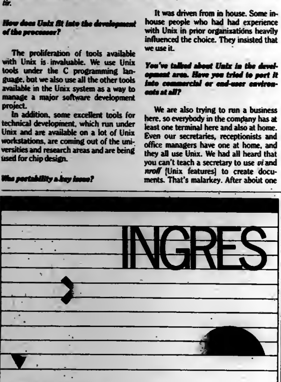

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In the News

Unix For Hire

For those fortunate enough to have Unix experience, the job market for the past two years has been insatiable — a golden egg time. As interest in the Bell Laboratories operating system has soared, the call for Unix expertise has sounded loudly and clearly. Scientific Placement, Inc. (SPI), a 20-year-old employment service for engineering and technical professionals in Houston, Texas, heard the call and has spent two years specializing in Unix placements.

Although the Unix job market has flattened a bit, according to Julia Rich, an associate at SPI, it is still in high gear. Both vendors and users are maintaining a steady need for Unix types. In certain areas of the country, however, the Unix market is saturated, verging on overcrowding.

According to Rich, the beginnings of a shakeout in the computer industry — for example, the crashing of such companies as Storage Technology Corp. and serious problems at others — have caused massive layoffs and a flooding of the market in certain areas. The effects of too many Unix folks are beginning to be felt in the more desirable and livable areas — Silicon Valley; Boston's 128 belt; Austin, Texas; Colorado; the Research Triangle in North Carolina and the Pacific Northwest. Salaries and job opportunities are beginning to reflect that impact. "On the other hand, there is tremendous demand in the Midwest," Rich said, "but people don't want to be cold."

Even with the unevenness of the geographic market, Rich maintained that Unix experience continues to be a marketable commodity. Such large vendors as Gould, Inc., Tandy Corp. and Texas Instruments, Inc. are currently seeking Unix professionals, and giants like IBM, Digital Equipment Corp., Hewlett-Packard Co. and others are constantly seeking Unix help in some part of the company.

Rich pointed out that although the smaller, start-up vendors were seeking basic "porters" for the early stages of Unix development, the larger companies with lengthier commitments to the operating system were now hiring Unix sales and marketing people. "The giants are looking for those with user interface and applications skills, but the others haven't got that far yet," Rich said. "They're still trying to get a product to market."

In the user community, "Help Wanted" signs attempting to lure those with Unix expertise are appearing at a growing number of companies — large, small and mid-size. Rich admitted that her view is "distorted" because she is so close to the market, but said she believes the Unix vacuum tends to scoop up personnel in waves. Currently, she stated, systems programmers and administrators are in demand, and countless requests come in for those with knowledge of both Unix System V and 4.2 BSD.

Ironically, many DP departments don't specify which version of the operating system they have committed to, Rich said, and she has had to learn from experience to ask. "I've set up interviews between people who knew System V and a company that was using System III. And it makes a difference."

Though cautiously optimistic, Rich admitted a shakeout was already under way in the Unix industry. As companies and products are sorted out, as AT&T "cleans up" System V and as moves are made toward standardization, the industry could change significantly.

"The market is maturing," Rich explained. "For the gurus, the market is shrinking. But at the other end — the people doing interfaces, applications, sales, marketing and support — the job demand will mature."

Unix vs. MS-DOS

Despite its overwhelming hold on the current personal computer market, the MS-DOS operating system is destined to be bypassed by Unix in 1990. According to a report in "Software Watch," an International Data Corp. (IDC) newsletter, "In 1990, the combined shipments of licensed and unlicensed Unix PCs will overtake MS-DOS PC shipments."

Among the causes for the role reversal is the appeal of Unix' multitasking, multiuser capabilities. Though the report predicted that MS-DOS "will be tweaked into a multitasking product" and extend its life in the marketplace, its capabilities will be limited to the point that it will serve only a low-end need for such systems. "More powerful multitasking PCs will require different operating systems, most likely Unix and Unix-like products," IDC pointed out.

In that regard, the report predicted that MS-DOS shipments will peak in 1986; the Unix personal computer base will continue to grow slowly until 1985 when unlicensed Unix PCs (referring to IBM and IBM-compatible versions of Unix) will start to take off. IBM, it pointed out, will most likely make a serious commitment to a version of Unix, but not one it will have to license from AT&T. With this in mind, the report predicted that shipments of unlicensed Unix personal computers will overtake shipments of licensed Unix personal computers by yearend 1986 and persist throughout the rest of the decade. "It's arguable that an IBM version of Unix will bury AT&T, which has comparatively little experience in either the personal computer market, or indeed, competitive markets in general," the report said.

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In the News

AT&T will nevertheless be a "major presence" by virtue of its experience in communications. Although Unix penetration of PC shipments will remain lower than declining MS-DOS penetration through the 1980s, strong overall Unix PC shipment growth will continue beyond 1990. "By 1986, 20% of business PC shipments will be Unix PCs and over half of those will be unlicensed versions of Unix," the report said. "By 1990, Unix PCs will account for 28% of worldwide business PC shipments and 56% of those will be of the unlicensed Unix variety."

Speaking of Standards

While the vendors duke it out in an attempt to create a de facto Unix standard, two groups have quietly been making headway toward an officially sanctioned standard for the operating system.

At the fall Comdex gathering in Las Vegas recently, the IEEE-Unix standards committee (officially named the T1003 Working Group on Operating System Kernel [Unix]) made serious inroads toward that goal.

Jim Isaak, director of product planning for Charles River Data Systems, Inc. and chairperson of the IEEE committee, said the meeting produced an agreement between /usr/ group, the four-year-old Unix users organization, and the IEEE committee that a single standard is essential and the IEEE committee should be the conduit for that search.

The two organizations also agreed to promote as a standards document the specifications set out by /usr/ group. Isaak pointed out that agreement on these points was based on pragmatism on both sides. "At this point, the IEEE is viewed as the most effective way to a widespread, highly visible standard," he said. "The /usr/ group is going to put down its effort and join us."

With its established channels for "grinding out" standards, the IEEE simply gives the Unix standards push a strong headstart. In addition, Isaak stated, an IEEE standard will immediately gain American National Standards Institute (Ansi) approval and, more than likely, international approval as a standard.

"When we talk about an IEEE or Ansi standard, we're not talking about just one community; it affects the entire U.S. and the ISO can pick it up for international standards," Isaak declared.

The vendors, of course, are watching carefully, a fact that has not eluded Isaak, who said, "We don't want to standardize a company's product. We want a standard that is industrywide." Though the model for the /usr/ group document is Unix System III, the segments of the operating system they are attempting to standardize are generally outside the areas of differentation between various flavors of Unix, he said. The IEEE document, which will focus on the systems interface and subroutines level, has in fact received solid support from AT&T.

"AT&T has been very active in the /usr/ group effort and has provided good feedback as to how this will relate to the System V environment," he added. "Basically, we'll see a document that is compatible with System V as well as System III. The areas of difference between those two systems tend to be in the extensions, and most of those are outside the scope of the standards."

One major Unix version, 4.2 BSD, has not had much input to date because of a lack of university involvement, which is where 4.2 has found a broad base of support. Isaak expects that to change when the standards document reaches the balloting stage.

"We're dealing with a nucleus, a very basic core of capabilities, and I don't anticipate problems with 4.2, or III or V or Xenix or whatever," he said. "Each of these versions has taken the basic nucleus and extended it in its own direction. But they are all working off the same basic elements, and that's what we tried to put into the standards."

In an effort to speed up the procedure, the committee has decided to follow what it calls a "trial use" route, which allows the document to be put into the standards distribution channel before resolving every final issue. The committee is also forming a balloting group to help prepare the final version of the document for balloting. Isaak predicted that if all goes well, the systems interface and subroutine portions of the standard may be adopted by October and possibly even by July.

The IEEE committee is meeting at Uniforum in Dallas, Jan. 21-22; anyone interested in joining the balloting committee should contact Isaak there or at Charles River Data Systems, 983 Concord St., Framingham, Mass. 01701. A copy of the current standards document is available for $30 from /usr/ group, Suite 200, 4665 Old Ironside Drive, Santa Clara, Calif. 95050.

Workstation Overload

Like the rush-hour subway train, the Unix-based technical workstation market is crowded to overflowing. The leaders, Apollo Computers, Inc. and Sun Microsystems, Inc., are being jostled by heavyweights like IBM, AT&T, Digital Equipment Corp. and Hewlett-Packard Co. and a host of aggressive start-up firms are pushing in the door as well.

The growing popularity of Unix has helped spur the market along and has actually helped change the face of the market considerably. According to

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In the News

Rebecca Hurst of Yates Ventures, Inc., a Unix consulting firm in Palo Alto, Calif., dedicated workstations, such as computer-aided design and manufacturing design machines, are being replaced by general-purpose, multifunction machines, much like what has occurred in the dedicated word processor world. Because of Unix' portability and programming strengths, it has become the operating system of choice on the new wave of workstations and has helped create a clamor for third-party applications software packages.

"The requirement for third-party software is immense," Hurst pointed out. "Access to third-party applications is a determining factor for a vendor's success in this market."

But while software developers are finding a bullish market, the hardware companies may have a tougher time of it. Larger firms such as Sperry Corp., Honeywell, Inc. and others introducing Unix-based workstations will find there is still room in the market "if you go about it in the right way," Hurst said. Rather than jumping into the general multifunction workstation fray, "which people are becoming very tired of," a vendor should pick a specialized niche or vertical market to target, she added.

Hurst gave as an example Daisy Systems Corp., a small Calif. firm that has become a leader in computer-aided engineering (CAE) workstations. "From the beginning, Daisy developed its own software and integrated it with its system specifically for CAE," Hurst said. "So there is really nothing on the market like them, and they'll probably become a dominant force in that market."

For Apollo and Sun Microsystems, the market is tightening, she said. "They will find themselves up against companies — like IBM, AT&T, DEC and HP — with long-standing reputations, larger installed customer bases and the ability to resort to cut-throat pricing," explained Hurst. And the front-runners, by not specifying a market niche, will find competing on that level more and more difficult. "Software companies can't keep supporting people on that level," she stated. "The big thing these days is differentiation. If you can become an expert in a couple of areas and address a vertical market, you are in a nice, strong position."

For the smaller companies, the outlook is not promising. "With Sun, Apollo and the big four in the market, it is becoming more difficult for smaller companies that are already offering or are planning to introduce workstations," Hurst said. "The market window is firmly closed for small firms entering with general-purpose workstations."

Dallas to Host Uniforum

Uniforum '85, The Worlds of Unix, will be held Jan. 21-25 at the Dallas Infomart. Nearly 60 tutorial and conference sessions are scheduled during the five-day period. Plenary speakers are Robert L. Carberry, vice-president, systems architecture and technology, IBM (Jan. 22); R.L. Martin, executive director, computer systems software, AT&T Bell Laboratories (Jan. 23); William N. Joy, vice-president, research and development, Sun Microsystems, Inc. (Jan. 24); and Robert Haley, vice-president, AT&T Information Systems (Jan. 25).

The 40 conference sessions are divided into four tracks of Unix: Office Systems, Personal Computers, Engineering/Programming and Market Trends. Information about free workshops will be posted in the registration area.

On the exhibitor side of the conference, 200 major vendors will set up 850 display booths.

"A comprehensive approach is what Uniforum is all about," Mark Weber, the show coordinator, said. "Everyone will be able to find a Unix product or service of interest on the exhibit floor. And with the variety of conference topics we're offering, everyone will be able to learn something, too."

More information is available from Uniforum, Suite 205, 2400 E. Devon Ave., Des Plaines, Ill. 60018.

Chestnuts and Rumors

Reports of a possible acquisition of all or part of Digital Research, Inc. (DRI) by AT&T are eliciting varied comments. A source at AT&T responded that the possibility of acquiring DRI is an "old chestnut. We're involved in lots of joint ventures, but we're not buying anybody. You ought to look at our cash flow sometime."

On the other hand, Tom Billadeau of the Gartner Group said, "AT&T is certainly shopping. They've definitely been looking around [but] DRI doesn't sound like an appetizing investment." Amy Wohl, of Amy Wohl Associates, noted that at a joint press conference last spring, representatives of AT&T and DRI seemed very friendly and that such a move wouldn't surprise her at all.

Stan McKee, DRI's chief financial officer, said the rumor of acquisition is "totally false. I don't know where the rumor started. There has been no discussion with AT&T. We've been working with them on a Unix library since last March at Uniforum, but that's it."

McKee was told a list was "circulating" of companies that AT&T was interested in acquiring and DRI was on it, but added that "I haven't seen a list and I don't know anybody who has."

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In Brief

BOSTON — A report evaluating the office product offerings of IBM, Wang Laboratories, Inc., Digital Equipment Corp., Datapoint Corp., Hewlett-Packard Co. and Data General Corp. is available from the Seybold Consulting Group. "The Guide to Integrated Office Systems," was designed to help the consumer select an appropriate office system and to assist vendors in their product development.

The report costs $400 and discounts are available for additional copies from Seybold Publications, Inc., Suite 612, 148 State St., Boston, Mass. 02109.

ENGLEWOOD CLIFFS, N.J. — "Unix For People," a hands-on guide to Unix, was published by Prentice-Hall, Inc. The 533-page hard-cover book was designed to introduce programming students and business people to Unix while at the terminal.

The book, authored by three faculty members at the University of California, Berkeley's School of Education, costs $29.95 from Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632.

RESTON, Va. — Longman Crown, Inc. introduced a series of tutorials on computer-related subjects for executives.

The "Executive Briefings," cover such topics as Unix, Ada, artificial intelligence, data communications, lasers and advanced microprocessors. Topics to be published in 1985 will include the C programming language. Briefings run from 32 pages to 64 pages and each includes summaries, case studies and lists of resources and vendors. Each briefing costs $24.95, the vendor said. More information is available from Longman Crown, Inc., 11800 Sunrise Valley Drive, Reston, Va. 22091.

EDISON, N.J. — Unipress Software, Inc. will hold a two-day course on Unix for marketing professionals Jan. 20-21 at the Loews Anatole in Dallas. Entitled "Unix for Marketeers," the course is designed to prepare marketing professionals with information necessary to understand and sell Unix-related hardware and software.

The course fee is $495. For more information, contact Joyce Bielen, Unipress Software, Inc., 2025 Lincoln Highway, Edison, N.J. 08817.

SAN FRANCISCO — IBM will market a version of Horizon Software System, Inc.'s integrated word processing and spreadsheet software for its Personal Computers running the IBM Personal Computer Interactive Executive (PC/IX) Operating System.

IBM IX Integrated Word/Math runs on the IBM PC XT, PC XT/370, PC AT and Personal Computers with the IBM Personal Computer Expansion. Unit. Priced at $600, it will reportedly be available in late January from IBM's National Accounts and National Marketing Divisions.

Calendar

Jan. 17-18, San Diego — **Developing A Unix Market Strategy.** Also, Feb. 14-15, Miami. Contact: Computer Technology Group, Telemedia, Inc., 310 S. Michigan Ave., Chicago, Ill. 60604.

Jan. 22-25, Anaheim, Calif. — **Programming in C: A Hands-On Workshop.** Contact: Ruth Dordick, Integrated Computer Systems, 6305 Arizona Place, P.O. Box 45405, Los Angeles, Calif. 90045.

Jan. 22-25, Baltimore — **Unix: A Hands-On Workshop.** Contact: Ruth Dordick, Integrated Computer Systems, 6305 Arizona Place, P.O. Box 45405, Los Angeles, Calif. 90045.

Jan. 29-Feb. 1, Boston — **How To Manage Software Projects.** Contact: Ruth Dordick, Integrated Computer Systems, 6305 Arizona Place, P.O. Box 45405, Los Angeles, Calif. 90045.

Feb. 4-6, Atlanta — **1985 Office Automation Conference.** Contact: OAC '85, American Federation of Information Processing Societies, Inc., 1899 Preston White Drive, Reston, Va. 22091.

Feb. 4-6, Atlanta — **Data Base: A Manager's Guide.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

Feb. 5-6, New York — **The Sovereign Superstate of IBM.** Also, Feb. 12-13, Palo Alto, Calif. Contact: Robert Stearn, The Yankee Group, 89 Broad St., 14th Floor, Boston, Mass. 02110.

Feb. 5-7, Monterey, Calif. — **The Sixth Annual Conference on Automation Technology for Management and Productivity Advancements Through Distributed CAD/CAM and Engineering Data Handling.** Contact: Peter C.C. Wang or D. Tegtmeier, Automation Technology Institute, Inc., Box 242, Pebble Beach, Calif. 93953.

Feb. 6-8, Dallas — **Personal Computers and the Mainframe Connection.** Also, Feb. 13-14, Boston. Contact: Data-Tech Institute, Lakeview Plaza, P.O. Box 2429, Clifton, N.J. 07015.

September 18-20, New York — **Unix Expo.** Contact: Robert Birkfeld or Don Berey, National Exposition Co., Inc., 14 W. 40th St., New York, N.Y. 10018.

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To Market, To Market

With so much hoopla going on in the marketplace, shopping for a Unix system can be overwhelming. If you plan carefully and assess your needs before you begin looking, that task can be made a lot easier.

By Ray A. Jones

C

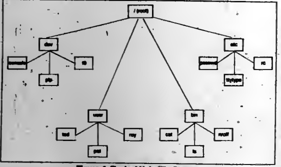

Figure 1. Typical Unix File System

- Storage Requirements: A typical Unix operating system will consume a very large amount of disk space — from 5M bytes to 12M bytes (depending upon the vendor) before you enter any of your applications programs or data.
- Documentation: The documentation currently available is not very good. It is better than it was just a year ago, and it will surely get better as time goes on, but for now it's awful.
- High Cost: This is more of a perceived problem than a real one. A four-user system will cost about $15,000, which seems high compared with the cost of a personal computer. Spread that cost over the number of users and the ability to share both peripherals and files, and the cost argument goes away.

What do you want your computer system to do? Whatever you want it to do, choose the software first. The software selection will influence the hardware requirements a great deal, as we will see later.

Office automation refers to accounting, word processing, text processing (there is a difference), electronic mail and financial modeling. Choose software that fits your business, not software that requires you to change the way your business runs just to fit the software.

Most of the accounting software that has been available up to now was written in Cobol, Dibol, Basic, and Fortran. These are mostly canned packages that are difficult if not impossible to change to fit the needs of a particular business. If you find a package that fits exactly, great. If not, look for a fully integrated accounting package based upon a rational data base that can be easily modified to your specifications.

If software development is your bag, Unix is the place to be. Choose the tools, languages and project control utilities from a long list of those available.

There are a number of sources of information on the software that runs in the Unix environment. Many manufacturers produce directories of the software that runs on their machines. However, in order to find software prior to choosing a machine, you must consult one of the independently published directories or a directory from one of the Unix user groups.

Now that you have determined what the computer is to be used for and have selected the software, it is time to narrow the choices of hardware. We will generate a series of specification sheets, leading to a final specification sheet that will describe the system you need.

System Specifications

Serial I/O Channels: We will start with the requirement for number of I/O channels. How many people, sorted according to the following categories of use, need access to the system?

Constantly _____
Sometimes _____
Seldom _____

Net number of users _____

Obviously, you will need a port for each constant user, but the "sometimes" and "seldom" user numbers are judgment calls. The "Net number of users" is the number of terminals you will need, not necessarily what the manufacturer refers to as "users." Transfer this number to the following chart.

I/O Port Requirements

	Serial	**Parallel**
Hardcopy		
Printer		
Plotter		
Typesetter		
Terminal/users		
Modem		
Other devices		
Total		

Insert the numbers for each of the devices you need on your system. Note that hard-copy devices can be either serial or parallel. Serial ports (RS-232) are standard on all systems, and parallel ports are generally extra-cost options. It is recom-

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mended that you reserve at least one serial port for a modem because you will need one sooner or later.

The total for serial devices is equivalent to the "number of users" that manufacturers refer to. For instance, many "four-user" systems are fully loaded with one printer, one modem and two terminals (all serial devices).

A word of caution: Most micros that are advertised as being eight-user to 16-user systems will not support more than three or four true "users"! These systems are interrupt-driven, which means that the CPU must service each key stroke as soon as the keyboard is touched, and three fast typists will bring the system to its knees. An optional "intelligent I/O controller" (which will cost approximately $2,000) will allow the system to serve more than four users.

Memory Requirements

Base requirement (one or two users) **512K bytes**

No. additional users X 128K bytes ____ ____

Total ____

or

Applications software

____ **+ 256K bytes**

Your system should have at least 512K bytes of memory, and you should add 128K bytes for each additional user. Check the memory requirements of the applications software you have chosen and add 256K bytes. Buy enough memory to cover the larger of these two figures. If the application software requires a very large amount of memory, you may want to consider a machine with virtual memory. However, the more memory in a machine, the faster it will run, and memory is cheap. Memory typically comes in 256K-byte, 512K-byte or 1M-byte increments and is least expensive purchased in the largest increment and at the time of system purchase.

Disk Requirements

Total storage for applications ____

No. of users ____ X 0.5M byte = ____

Base requirements of full Unix ____

Swap area ____

Total ____

Again, check the requirements of the application software you have chosen to determine the disk storage space needed (include both program and data). Add 0.5M byte for each user to use a scratch area. Include the amount of disk memory that will be consumed by the Unix operating system. This can be a significant amount depending upon the particular implementation, from 5M bytes to as much as 12M bytes for full System V with Berkeley enhancements and the on-line manual.

The operating system also requires an area on the disk called the "swap area" for swapping processes in and out of main memory. This also can be a large chunk of disk — from 1M to 4M bytes or more. The system I use has 12M bytes of operating system and uses a 4M-byte swap area, therefore consuming 16M bytes of disk space before the first application program or byte of data has been entered.

If all your users will be in close proximity to the paper copy of the manual, you can remove the on-line version and gain several megabytes of usable space.

Beware of salespeople when they quote disk size. Make sure they are giving you formatted disk size. The size difference between formatted and unformatted can be large. For example, a 10M-byte unformatted disk is only 8.4M bytes after formatting.

Also, salespeople tend to round off the disk size, usually up. At various computer shows I have heard one very popular disk described as having 400M, 420M, 450M, 474M or 500M bytes; it actually has 474M bytes unformatted and between 420M and 450M bytes formatted.

Back-Up Device

Murphy's law has not been repealed! Sooner or later, through a power failure, programmer's error, hardware failure or "cockpit error," your system will crash, and you will need that backup. Backups should be done every day to be safe, weekly by the more daring and monthly or less often by those who love pain.

When choosing the backup device, consider the time it will require to actually do the backup. If the time required is more than 30 minutes, the temptation not to do it is great.

Another thing to remember is that your system cannot be used while the backup is taking place.

Use the following equation to approximate the time required:

Disk Size/Media Size = No. of Media Required

Media Required X Time for Each = Total Time

(Where disk and media sizes are capacity in bytes.)

Some typical backup media sizes:

5.25 in. floppy (single-side) 300K
5.25 in. floppy (double-side) 600K
8 in floppy (double-side) 1.2M
.25 in. streamer 20M to 40M
.5 in. 9-track tape 40M to 80M

The number and time for a full system backup on a relatively small system (such as mine) with a 21M-byte disk and a 5.25 in., 600K-byte floppy are as follows:

21M/600K = 35 floppies
35 floppies X 5 min = 175 min

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With a .25-in. streamer, the time required is reduced to only 7 minutes.

Actually, my system requires 36 floppies, but I said the equation was an approximation. The 5 minutes per floppy includes formatting. With preformatted floppies, backup still requires 1.5 hours of sticking diskettes in that slot — a pretty boring process.

Many people argue that a full system backup is not necessary and that incremental backups (dump only those files that have changed since the last backup) can suffice.

True, you will have the data under these conditions, but the restore process is for masochists only. Imagine doing a full system restore from the master backup (36 floppies) plus one or more floppies for each incremental backup — in the order done. Great fun if your crash comes after six months, and you have daily backups!

Recommendation: Buy a system with a tape drive, either a streamer or a 9-track .5-in. drive. Your investment will be recovered in the time saved in doing backups alone.

Most Unix micros have a floppy as a standard item, and many have tape drives as options.

Portable Media Device

If you will need to send or receive large amounts of data between remote systems, you will need portable media. The only portable media today are 8-in. floppies (not very popular) and 9-track .5-in. tape — one more reason to have a tape drive.

Special Requirements

If you have any of the following special requirements, be sure to include them in the final specification sheet: Real-time application (requires major changes to Unix or the hardware. Very few — I know only two — manufacturers have real-time Unix systems); bit-mapped graphics; special languages; special input or output devices; and floating point accelerators or array processors.

Final Hardware Specifications

Now you can complete the system specification form:

Serial I/O ______
Parallel I/O ______
Memory ______M
Disk ______M
Backup Device ______*
Portable Media ______*
Special Requirements ______

**should be the same device*

Support and Service

Support and service are the two most important aspects of any computer purchase. Find out who will support the hardware amd how. Also, find out what kind of support you will get for the software and from whom. Don't buy until you feel comfortable with these items.

Go For It

If you still have any money left in the budget, some optional equipment should be considered:

If you get twice the disk size you think you will ever need, it will be full in three months instead of in one.

- High-speed disk drive. Buy the disk with the shortest average access time you can get. Because Unix is a very disk-intensive operating system, the greatest increase in overall performance will come from a shorter access time.
- More memory — both main memory (random-access memory) and disk memory. If you get twice the disk size you think you will ever need, it will be full in three months instead of in just one.

Smoke

Each manufacturer tries to make its own machine appear better than the next company's. They all shout "It's new — it's wonderful," but mostly it's smoke. Sometimes the bells and whistles are useful, sometimes not. For instance, virtual memory is useful if you have very large programs. However, the virtual memory implementation on many of the 16-bit micros actually slows the system down because it causes excessive swapping. If you need virtual memory (for scientific applications), buy it; if you don't need it, avoid it.

One last bit of smoke — benchmarks. All manufacturer-generated benchmark programs were designed to show off the manufacturer's own equipment and make the other company look bad. The only benchmark that makes any sense is the application program that you will use in your business. ≡

Jones is the president of Onager Publishing, San Jose, Calif., publishers of the Unix Applications Software Directory.

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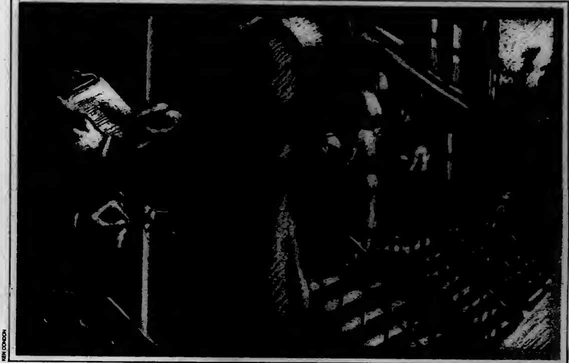

KEN CONDON

Who's Using Unix?

By Jeffrey Cogen

While the viability of the Unix operating system continues to be at the vortex of countless questions, the real world of computing goes on. For management information systems managers and data processing directors, the decision whether to opt for Unix or to remain with their vendor's proprietary operating system has no simple answer. Many have chosen to be spectators in the Unix controversy and wait until the shape of the market becomes clearer. Others have begun to dabble with one or more of the many Unix alternatives. *Computerworld Focus* recently interviewed decision makers in 35 large organizations to find out what the current status of Unix is in the trenches.

About 15% of the companies surveyed have Unix systems in either production or development environments. The number of companies that used Unix in production environments for office tasks was about equal to the number that used the operating system for program development. In both cases, Unix was generally not used companywide, but in small departments on minicomputers or high-end micros. Unix may be found in large companies, but it was usually considered a nonstandard operating system there — an isolated occurrence in a sea of more common systems software.

A small number of the surveyed companies are using experimental systems to evaluate Unix in the organization. More than 70% of those surveyed said they either have not evaluated Unix yet or are not considering Unix for their organization. None of the nonusers indicated they were seriously considering Unix for their firms, although a few expressed an interest in exploring Unix as a multiuser system for microcomputers in the future. One such organization, National Aeronautics and Space Administration's Jet Propulsion Laboratories in Pasadena, Calif., has recently converted some of its minicomputers to Unix. None of the respondents expressed any interest in implementing Unix on mainframes.

Among the reasons companies cited for not using Unix were the following:

- Cost of converting equipment.
- Time required to learn a new operating system.
- Unwieldly number of versions in the marketplace.
- Lack of applications software.
- Lack of mainframe versions.
- More complicated user interface with Unix.

Perhaps the most telling criticism was that vendors had been unable to convince organizations that Unix is superior to proprietary operating systems. The majority of companies viewed Unix as an option that must be justified. On the other hand, no one has ever been fired for buying IBM with IBM system software.

Unix must be noticeably better in order to attract interest; for the huge majority of those surveyed, it was not. According to Andrew Clifford, systems manager at Millipore Corp. in Bedford, Mass., "The VAX runs equally well under Unix or VMS, and VMS came with it."

Most respondents were not bowled over by the capabilities of Unix in the business arena. "I don't see a system yet that keeps the power of Unix and makes it usable in the general office environments," said James Godwin, chief of the user application office at the Library of Congress in Washington, D.C. Another major concern with Unix is its limited use on mainframes. "We don't think Unix is appropriate for large systems," Mel Ivey, systems officer at the First National Bank of Chicago, said. "It has not been proven on large machines."

The bank, however, has seven microcomputers (including IBM Personal Computer XTs and Unix-based micros from Fortune Systems Corp. of Redwood City, Calif. and Plexus Computers, Inc. of San Jose, Calif.) running Unix for applications such as spreadsheets, WP and electronic mail. According to Ivey, the computers supporting most of the program development in the bank, as well as large-scale production tasks, are IBM mainframes running IBM system software. Ivey added, however, that Unix systems may become stronger in the mainframe market and that firms such as his may then consider getting into Unix in a bigger way.

Other respondents disagreed. "I don't anticipate Unix by itself to be around in the future," said Steven Silva, manager of user information services at Commercial Union Insurance Companies in Boston. "I see Unix being offered under another operating system, such as a suboperating system under IBM's VM," he said. According to Silva, this consolidation would reduce the cost of supporting different mainframe operating systems, while increasing portability.

Commercial Union's eight-year-old Digital Equipment Corp.-based system is used by employees to track attendance, medical records and schedules. Silva said Unix is more flexible for application development but is more complex than other operating systems for office users.

Other obstacles to Unix integration include questions about its portability. "The degree of portability depends on access to source code or vendors porting Unix to the machine," Godwin said. "You usually don't have access to source code in the commercial world."

"There is still not a lot of off-the-shelf software that is compatible between machines," Ivey said. This situation is likely to improve if and when the industry standardizes on one version, a wish near the top of the list of a number of companies.

The survey results reflect the fragmentation of the market. Respondents represented a wide variety of Unix versions, including AT&T's System V, the Berkeley 4.2 and Microsoft Corp.'s Xenix. No one version dominated.

According to Mosher, Bell South Services uses System V on DEC VAX-11/780s and AT&T 3B20s for applications such as electronic mail, WP, spreadsheets and calendaring. Mosher said the firm is committed to Unix for OA, but not as a general development tool. One reason for this direction, according to Mosher, is that Unix systems will never be as powerful data base managers as traditional mainframe systems.

Whatever their commitment, most Unix users are satisfied with Unix itself. "It is a friendly environment to do coding in — fairly efficient and quick," said Glenn Creel of Hughes Aircraft Co. Creel, a member of the technical staff in the company's Space and Communications Group in El Segundo, Calif., said the Unix system, used by employees in his department for developing microprocessor code, was the only option boasting multiuser capabilities.

Another Unix admirer, Chris Sheffield, an OA specialist with Wells Fargo Bank in San Francisco, said, "Unix is very user-friendly and flexible. I can do many things without writing code." The bank has six DEC PDP-11/70s running Unix and supporting about 3,000 users who range from executive vice-presidents to clerks. The system is used for electronic mail and document processing and, Sheffield said, in his view, there are no significant drawbacks to Unix. He added, however, that in order to set up a bankwide network, a bridge from the Unix system to IBM's Professional Office System (Profs) environment is being written.

Many nonusers in the survey reported that Unix does have potential, but that they would wait and see what the rest of the market would do before running out and converting to Unix. This attitude seemed to be the cause of a great deal of inertia. In part, the lack of enthusiasm stems from the major vendors' uninspired commitment to Unix. Danielle Barr, vice-president of office systems at the Bank of New England in Boston, said, "We don't see an IBM direction." A firm step by IBM into the Unix marketplace could make it instantly dynamic.

For now, most respondents that said they would consider Unix in the future also said its potential lies not with large computers, but with micros. An oft-heard comment was, "We keep reading about Unix, but we haven't been able to try it." Others said they are in the midst of developing a microcomputer strategy and have not gotten around to implementing a multiuser Unix environment instead of more standard operating systems.

At Sunbeam Appliance Co. in Oak Brook, Ill., microcomputer networking is a low priority item now, according to technical specialist Greg Heynssens. Heynssens said the company will look into Unix as a networking strategy in the future, possibly in conjunction with IBM Personal Computer ATs. The dearth of applications software for the 15-year-old operating system is an often cited fear with such firms. Whether caused by the numerous versions or by a lack of commitment from third-party software vendors, the scarcity of Unix applications is keeping potential users at bay, and confirmed users may also be growing edgy. "Unix is being marketed as an operating system for the people," said Silva of Commercial Union Insurance. "The user shouldn't care about Unix or any other operating system unless he is going to program. And an operating system doesn't do the user any good if there are no applications for it." ≣

Cogen is a free-lance writer based in Boston.

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3301-01

See How It Runs...

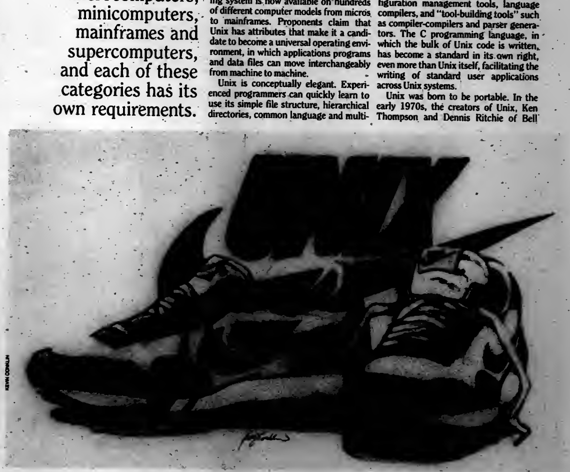
By Dennis Barlow

Unix has come a long way since the early 1970s. It currently runs on microcomputers, minicomputers, mainframes and supercomputers, and each of these categories has its own requirements.

The career of Unix has been a bit like that of a newly discovered recording superstar — an explosion of popularity preceded by years of journeyman obscurity. Once focused mainly on small minicomputers within the confines of academic and research institutions, this multiuser, time-sharing operating system is now available on hundreds of different computer models from micros to mainframes. Proponents claim that Unix has attributes that make it a candidate to become a universal operating environment, in which applications programs and data files can move interchangeably from machine to machine.

Unix is conceptually elegant. Experienced programmers can quickly learn to use its simple file structure, hierarchical directories, common language and multitasking facilities. Unix system functions are well-defined by high-level language programs and are therefore readily implemented in a standard fashion on different computer architectures. Besides being an operating system, Unix is a complete and sophisticated software development environment, including development and configuration management tools, language compilers, and "tool-building tools" such as compiler-compilers and parser generators. The C programming language, in which the bulk of Unix code is written, has become a standard in its own right, even more than Unix itself, facilitating the writing of standard user applications across Unix systems.

Unix was born to be portable. In the early 1970s, the creators of Unix, Ken Thompson and Dennis Ritchie of Bell



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Laboratories, rewrote the system code several times as they moved it from a Digital Equipment Corp. PDP-7 environment to a PDP-11. Finally, Bell Labs moved Unix to an Interdata, Inc. 8/32 and the University of Wollongong moved it to the Interdata 7/32. One attractive feature of the Interdata machine as a guinea pig was its IBM System 370-like instruction set.

In the mid-1970s, Unix became prevalent in the university environment because it was the best time-sharing operating system at the time for the PDP-11 and the price was right. An academic institution could obtain a copy for a nominal fee. The Unix user community grew rapidly, and universities began to matriculate Unix-trained programmers. The Usenix users group was formed, and a small industry grew to serve these otherwise unsupported users.

When researchers at the University of California at Berkeley ported Unix to VAX computers, they changed it irrevocably. By adding performance improvements, virtual memory capability and hundreds of utilities programs, these implementers enhanced Unix greatly, but at the expense of standardization. The lack of a strong force to control Unix evolution has resulted in numerous dialects of Unix, although compatibility remains largely intact at the C program source code and file levels. The Unix families include those based on Bell Labs Version 6 and Version 7; AT&T System III and System V; and Berkeley versions 2.9 (for the PDP-11), 4.1 and 4.2 (both for the VAX). The variety of Unix versions continues to grow, although they are coming to agree on a core of AT&T System V-based features. These many versions are distinguished by the computer environment that hosts the Unix implementation, features and functions needed by the system user and by the heritage of the Unix version used in the port.

Four classes of computer systems produce different requirements for Unix based on their architectural characteristics and intended applications marketplaces: minicomputers; workstations and personal computers; mainframe computers; and supercomputers.

The category of minicomputers is very broad and includes systems that support as few as four users or as many as hundreds of users. Machines in this class tend to directly support a population of more than one user. Their use is dedicated to an application or to an application area, such as a department within an organization. They are architecturally straightforward and typically have a single bus-oriented structure.

Of the four categories of computer machinery, Unix is most numerous in the minicomputer arena. This is because of the historical roots of Unix on minicomputers and the advantages of its strong software development environment in a marketplace where programming tools tend to be weak. Although it has a variety of established scientific, engineering, and typographic applications, Unix trails other operating systems in applications in nonengineering areas. Either through the manufacturer or a third-party source, almost every common mini will accommodate Unix — DEC's PDP-11 and VAX series; Data General Corp.'s Eclipse; the IBM Series/1; and models from Perkin- Elmer Corp., Gould, Inc., Harris Corp., Texas Instruments, Inc., Wang Laboratories, Inc., Four Phase Computer Systems, Inc. and others. The installed base of Unix-based minis is well over a billion dollars.

After its recent divestiture, Western Electric Co. made Unix System III and System V into more of a commercial than a research-oriented product, offering better support, a smoother evolution path over product upgrades and volume discounts on price. Western Electric has entered into joint development agreements with the suppliers of the newest microprocessor chips, the Motorola Semiconductor Products, Inc. 68000, Intel Corp. iX86, National Semiconductor Corp. 16000 and Zilog, Inc's Z8000 series.

This has provided systems integrators, particularly computer manufacturer start-up companies, with a ready-made operating system. Now a vendor can create a computer system hard-

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ware design from standard components without having to worry about also having to build a corresponding software development and applications environment. . Indeed, companies such as Convergent Technologies, Inc. and Flexible Computer are creating a new type of computer industry by providing modular minicomputers with Unix to companies that want to offer, but not design, proprietary computer systems. Other companies, such as Plexus Computer, Inc., Pyramid Technologies, NCR Corp. and AT&T, have specifically targeted the Unix marketplace and sell more routinely configured Unix-based minis into it.

Caps remain in the lineup of Unix capabilities for minicomputers: the lack of high-performance features needed for data base, transaction and real-time processing. Increasingly, minicomputers are being used in communications and departmental integration applications, as file servers playing host to a network of smaller computers or as supervisory controllers of satellite processors in a factory automation environment. Unix lacks a standard means of satisfying these network-control and time-critical requirements. At present, each manufacturer must supply its own approach.

Minicomputers have been very good to Unix. Now Unix may be able to return the favor. New developments in minicomputer technology may come in the form of Reduced Instruction Set Computer (Risc) systems, currently under development at major research labs throughout the country. Risc systems utilize simpler instruction sets, but operate at faster clock rates and over wider data paths of 32 bits to 64 bits than do present-day computers. They also hold out the promise of higher cost performance computing systems than are available today. Because Unix is prevalent in the research environments as a software development environment and because of its other virtues, protptype Risc systems favor the C language and Unix. The Risc approach to computer architecture is available in the marketplace today from Pyramid Technology.

The category including Unix on workstations and personal computers covers stand-alone machines dedicated to a single user but possibly expandable to support one or two additional users on outboard terminals. The recently announced IBM Personal Computer AT is a good example. A popular pastime of computer pundits is to predict a sweeping Unix penetration into the office via personal computers and workstations. Although Unix has attained some penetration into the marketplace for workstations and personal computers, it has several problems in serving this class of processors. The "person productivity" software — for example, business graphics — that dominates the personal computer marketplace has completely passed the Unix world by, and the Apple Computer, Inc. Macintosh is redefining expectations of a user-friendly interface while Unix command processors still suffer from hacker's stutter.

Personal computers and low-priced, low-powered workstations do not have the power to run a multiuser, multitasking time-sharing system. To port Unix to this smaller type of system, designers must be concerned with such technical issues as the time and space overhead of the Unix system, lack of memory in the central processor and disk drives that cannot support the paging rates that Unix demands.

While many vendors rightfully view these drawbacks as opportunities, it will be a long time before some restricted, tamed versions of Unix become viable for personal computer users. Vendors are coping with these problems by adding market-specific features to Unix; by paring Unix down to single-user designs or porting older, more restricted versions of Unix such as Version 6; or by using Unix loosely as a supervisor to initiate smaller, more efficient personal computer guest operating systems such as MS-DOS or CP/M.

This last approach is taken by Digital Research, Inc., which seeks to implement for the leading microprocessors a Unix-compatible operating system that supports both MS-DOS and CP/M as guest environments. Microsoft Corp., the vendor of MS-DOS and the original author of IBM's PC-DOS, takes the first

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approach with Xenix, a product that offers the user a more friendly command language than the standard "shell." This package accounts for over 50% of the installations of smaller Unix-like systems, according to Microsoft announcements. One of the first Unix-like systems on the market was the Version 6 port from Whitesmiths, Ltd known as Idris. Although upgraded since its initial release, Idris retains its smaller, sleeker profile.

Unix is appearing on a class of powerful workstations, exemplified by the Hewlett-Packard Co. 9000 series and the Sun Microsystems, Inc. computers; these machines have the performance characteristics to support Unix and their market targets engineers and systems developers who need Unix' tools. More than 30 companies are preparing for market or offering single-user systems with a 16-bit or 32-bit processor, central storage of up to 4M bytes, local mass storage of up to 100M bytes, a graphics display and, very often, Unix. In future, this will become a commodity market similar to that for personal computers, dominated by a few low-cost producers. Unix will probably become a common operating environment on these machines. In most offices and applications, however, Unix will be confined to a minicomputer acting as a host server to a satellite population of personal computers, each running a standard personal computing operating system such as PC-DOS or PRO-DOS. In this environment, Unix developers must provide communications services, tie-ins to corporate mainframes (IBM), local data base and transaction processing and document archiving capabilities.

Unix is available on mainframes from IBM, Contral Data Corp. and Amdahl Corp., with Honeywell, Inc. and Sperry Corp. possibly to follow, but the prognosis for greater acceptance of Unix on mainframes is uncertain. Unix is not well-suited for applications such as transaction-based, data based or closely coupled network computing, nor can it maintain tight control of computing resources. In addition, the installed base of operating systems such as IBM's MVS or VM (and applications) is so valuable no new system could readily supplant them.

This story may have an unexpected happy ending. There are hints that IBM might choose to take a whole new direction with Unix. IBM has a plethora of incompatible operating systems in its sprawling product lines, and this has actually helped to satisfy all the needs of a widely varied population of IBM users. But it remains difficult for IBM customers to integrate multiple IBM systems because of the insufficient commonality of data interchange and presentation formats, programming protocols and conventions and user interface standards. The problem got worse when IBM introduced new operating systems into its personal computer line — PC-DOS, Topview, Xenix and PC-IX. IBM also wants greater integration of system interfaces among its PC, System 36 and System 370 architectures so that the latter two may serve as hosts for the former. IBM could opt to adopt a Unix-like model for integration. This would probably serve to subsume the entire Unix marketplace under IBM's sway, much to the chagrin of AT&T. IBM isn't likely to accept a competitor's software standard without changing it irreconcilably.

Unix has been ported to supercomputers provided by Cray Research, Inc., CDC, Denelcor and Nippon Electric Co., Inc. These computers most often find their way to the same research environment that spawned Unix. Their buyers are increasingly requesting Unix because of its mature development environment, the availability of university-trained Unix programmers and the availability of some of the existing scientific applications software. Unix may become the universal development environment for this class of computers. However, although it may help supercomputer users in the software development cycle, Unix may have little impact in direct supercomputation management because the applications programs themselves are so highly customized. This is one class of computing where the Unix application software portability may have a minimal effect.

Unix philosophy and features are here to stay, and they will be absorbed into new and existing operating system software products in all levels of computing. This will happen regardless of the eventual penetration of the pure Unix product into the market. After all its development effort, AT&T apparently has no proprietary claim on these ideas, although it has been able to trademark the Unix name. The company might have been able to protect Unix before its concepts entered common computer science discourse. System V will be a core standard among Unix purveyors — unless IBM rewrites the rules — with most adding customized features such as the Berkeley enhancements.

The application-level standardization of data file interchange and the C programming language will continue and will benefit users and providers alike. The level of standardization of Unix facilities will increase, especially in areas like graphics storage and presentation and in data base processing. At the systems kernel level, however, Unix will continue to diverge into many dialects suited to differing applications and needs. This will be especially true across each of the major classes of computer systems — minis; workstations and personal computers; mainframes; and supercomputers. ☰

Barlow is a senior consultant with Arthur D. Little, in Cambridge, Mass.

GREG WENZEL

A Princely Transformation: Making Unix More Friendly

By Michael Heffler

The Unix shell, a wonderful tool for programmers, is the standard user interface on Unix systems. Nevertheless, the concern exists that the shell is an inappropriate user interface for those who are not programmers. But because the only people who should use the shell are programmers and system administrators, the concern is not valid. Application programs hide a computer's operating system, just as the operating system hides the underlying computer hardware.

The same concern is not raised regarding the PC-DOS command interpreter on the IBM Personal Computer because the programs most end users interact with on the PC conceal the DOS interpreter.

If the shell is not the user interface for most end users, what is? This question has a wide range of answers.

In the brief history of the computer business, smaller systems have followed larger ones in their growth and development. Mainframes were followed by minicomputers, and minis were followed by microcomputers. Techniques for developing and designing hardware and software migrated from large to small computers. When personal computers hit the mass market, this pattern changed; innovations and development activity focused on these machines.

With the advent of programs such as Lotus Development Corp.'s 1-2-3 and Ashton-Tate's Framework, the PC user starts up his program and the DOS command interpreter is hidden. The user is in a new environment that covers the underlying PC-DOS system. This new environment was specifically designed to address the needs of the person using the program.

Opportunity follows money as surely as night follows day; thus the main effort to improve the user interface has been in the PC-DOS world, where volume sales opportunities currently exist. Unix, however, runs on computers that can support more than one user, and that capability allows each user to run several programs at once (multitasking). People are discovering the limitations of personal computer operating systems — PC-DOS, for example — and large computer manufacturers are beginning to offer less expensive Unix-based systems as alternatives.

As the sales of Unix systems increase, so will the emphasis on ease of use in Unix programs. Because Unix is superior to PC-DOS as a system for program development, it follows that the commercially available products developed on Unix will have user interfaces that have been at least as well customized.

An appropriate user interface is one that is the appropriate garb for the program and that meets the specific user's needs (at his current level of ability) for the specific task at hand.

A spreadsheet user's set of actions and options differs from the actions and options of a word processor user. The user interface for each of these packages will be tailored to the needs of the user, just as the user interface for a system for travel agents or hotel clerks is tailored to those users.

Users working with programs go through three stages:

- What can I do?
- How can I do it?
- How can I do it quickly?

Programs should have three modes of operation: novice, normal and expert. The novice mode should be equivalent to an operational tutorial. The user should be presented with helpful information whenever it is needed. At first, there's no such thing as too much Help. Later, as the user reads it for the second, third and then the fourth time, the Help text clutters the screen, takes time to display and becomes a hindrance instead of a help.

When the user becomes familiar with the program, the normal mode of operation can be used. This mode makes Help information available upon request, but does not clutter the screen with information not in use or not requested.

In expert mode, the user can also request Help, but other Unix system features are made available to the expert. These features might have overwhelmed the novice or been downright dangerous in inexperienced hands.

The model of three separate operational levels is appropriate for many applications. The basic premise used in designing the user interface to a program should be that the program should not get in the user's way by being either too complex or too tutorial in its usage.

The beauty of Unix, from the programmer's point of view, is that it provides tools that complete tasks quickly and efficiently. These tasks can be tedious and time-consuming to complete on other systems. For example, the command:

```
GREP FRIENDLY *.DOC
```

will find every occurrence of the word "friendly" in every file that ends with the suffix ".doc." It prints each line containing the word "friendly" in each file, prefixed by the file's name. For example:

```
CWORLD.DOC: word
"friendly" in every file that
```

is one line resulting from a GREP command on this article. On PC-DOS you would have to look at each file with your editor or word processor, do a global search for "friendly" in each file and write the file name on a notepad to keep track of occurrences of the word.

The use of GREP and other Unix commands remains outside the realm of most people for two reasons: it takes two sentences to explain a simple usage of the GREP command, and the Unix manuals' documentation is a bit terse in its explanation of Unix commands.

It is the responsibility of the application developer to bring the power of Unix to the application while hiding the details of Unix behind prettier, more appropriate wrappings. For example, inside the program, the capability to look up someone's address for a letter could make use of the GREP command. The user need only know that an address is being located for his use.

When developing a program, one must have a model for the system and for the user. For example, if one is replacing an adding machine, the model for the user is anyone who does basic arithmetic — an accountant, a student and so on. But the model for creating the system does not have to be a machine that solves arithmetic equations in a linear fashion, one equation after the other. The popularity of spreadsheet programs is at least partially a result of their ability to perform arithmetic calculations over several rows and columns of figures in one fell swoop.

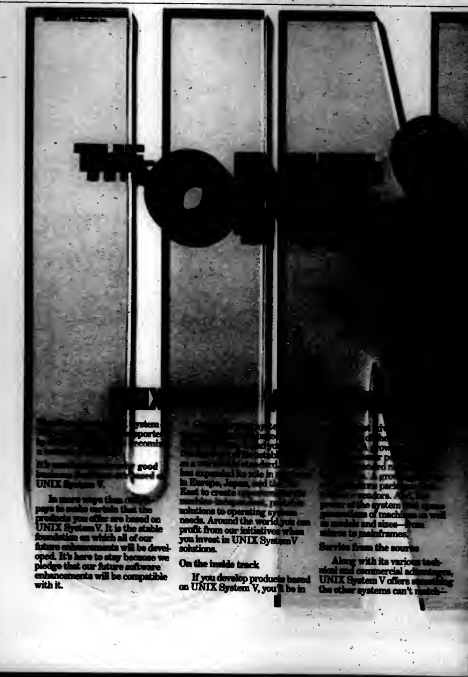
The user need not be concerned with the fact that each individual calculation has been performed by the computer. How they were performed is also of no concern, given that they are correct.

Unix also has advantages over PC-DOS in another area: a single request by a user can cause several programs to work together to perform the action initiated by the user. The fact that more than one program is running is hidden from the user. The power of this multitasking environment is far greater than the one-program-at-a-time mode of most personal computers.

Several programming tools and techniques are used on Unix systems for improving the user interface of application programs:

Menus: Menus allow a user to choose from a list of actions the action the computer should perform. Menus are easy to learn, require little or no training and are appropriate for a wide range of users on a wide range of applications.

On the down side, when a large number of choices require a large number of menus, this user interface tends to be cumbersome. Imagine, for example, a library with tens of thousands of books; in order to find one of these books, you must search



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through menus set up by category, subcategory and so on.

When the choices are within reasonable limits, however, and the user does not lose context navigating between menus, menus can be an exceptionally easy to use interface.

Forms: Filling in forms can be simple and straightforward, particularly if Help information is available for each field in the form. A key difference between forms and menus is that menus always present a clear choice; forms, when first displayed, present blanks to be filled in. Blank fields are less intimidating to novice users than a blank screen or a system prompt, but they are blank. Both forms and menus can also validate user input immediately and reduce the most common form of errors: typos.

Forms can also be used for data base or data entry applications. They can be the mechanism used in keyword searches. Once used, forms are an easy and convenient user interface that can be used for data entry as well as data retrieval and display.

Windows: Windows are a tool for programmers who wish to perform more than one task at a time and to monitor the progress of each task over time. A problem with windows is that each window in use takes up some portion of the CRT screen. The screen is a limited resource that provides the only view of the computerised world the user is working with. Although it is a boon when a computer can do many things at once, not many people can efficiently do more than one or two things at a time. Windows have their uses and can be quite helpful, but they must maximise the capabilities of both the screen and the user.

Touchscreens and touchpads: For choosing options on menus, selecting topics from a map and so on, touchscreens and touchpads can be useful. Some users experience arm fatigue when they use touchscreens consistently for more than 20 minutes at a time. People accustomed to using a keyboard to interact with a computer system tend to find touchscreens inconvenient.

Certain applications require only limited interaction between the user and the computer. For these applications, touchscreens can be quite effective.

Touchpads are increasing in sophistication. At a recent trade show, a company demonstrated a touchpad that held up to 22,000 characters per square on the pad. The pad contained over 100 squares. One could place any kind of map or template over the pad for a particular application. When the keyboard is not the method most end users are accustomed to — and even in some cases where it is — this user interface could save an enormous amount of typing.

Mice: The mouse is the user interface tool used on the Macintosh and Smalltalk systems. The mouse is often used with icons that symbolically represent objects that can be manipulated by the application.

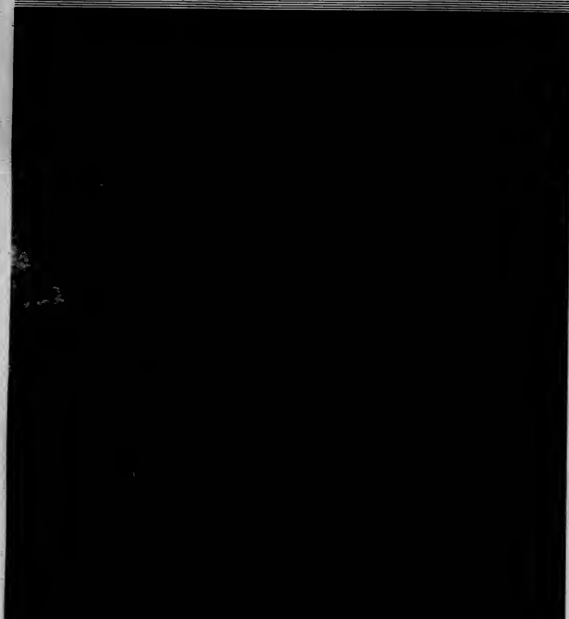
Some users encountered problems when using mice. These included knocking things over on their desks or running out of room for manipulating the mouse. It is easier to use a mouse than the arrow keys on a keyboard, as long as adequate room is provided.

Voice recognition: Computers need specific input in order for the input to be accurately recognized. Accents, slurred words and so on cause all kinds of problems. Although voice recognition could save on typing and provide computer access to a large number of nontypists, it is not available at this time at a reasonable price for many users.

Unix systems primarily interact with inexpensive, asynchronous Ascii terminals. The pretty graphics displays seen on many IBM PC and Macintosh applications are not seen on Unix applications. Touchscreens, touchpads and the mouse are also not used on most Unix systems. As the dollars flow toward Unix with the sale of Unix systems, we will be seeing these and other user interface tools in front of applications on Unix.

The key idea in developing a program on Unix is to design the user interface, the part of the program seen by the world, to be suitable for its end users while it makes use of the rich set of tailoring tools that Unix offers. ≣

Heller is executive vice-president of Softest, Inc., a firm based in Ridgewood, N.J.



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Unix Heats Up, But Will the Flame Keep Burning?

Unix will grow stronger, especially in some markets, and 1985 will be a shakeout year.

By Jean Yates

The future of Unix has been discussed, defined, projected, poked at, made fun of and lauded to the skies. Everything — you name it — has been written about Unix. To that discussion, this article will now add a projection of the trends in the Unix phenomenon in 1985, including a description of the companies, markets and trends as well as the many needs of the end user. Solutions to some key problems will also be suggested.

Who controls the Unix market? It is now arguable that AT&T has supplanted Microsoft Corp. as the number one influence in the Unix market. AT&T's large advertising campaigns, its introduction of a Unix-based computer family and the beginnings of an extensive distribution network all place the company at the verge of controlling not only its Unix product line, but also the direction of the whole Unix market.

AT&T may be number one, but Microsoft, Sun Microsystems, Inc., Digital Equipment Corp., Hewlett-Packard Co. and IBM also control Unix.

- IBM adapted Xenix for the Personal Computer AT and Microsoft's stated MS-DOS-to-Xenix connection could upset AT&T's future Unix standards.
- Sun's proposed definition of a cross-vendor local-area network standard for Unix is creating confusion about distributed Unix' future.
- DEC, 25% of whose VAXes run Unix, is beginning to recognize the impact of that client base on its future and to react with more Unix products.
- HP is losing sales in engineering (its home territory) to Sun, Apollo Computer, Inc. and other engineering/scientific vendors with Unix-based products.
- IBM's general waffling, wandering, meandering and indecisive smoke generating have slowed down the Unix market, an impact that must not be underestimated.

AT&T has changed dramatically in the last 12 months. After several reorganizations, James Edwards has emerged as president of the AT&T Information Systems (Attis) Computer Division, which is charted to provide third-party distribution of AT&T computer products.

Edwards may have an even wider role in Aftis as a guiding light for AT&T's push into the computer market. John Boyd, recently named vice-president of sales for Edwards' division, is another market-savvy choice. Boyd originally ran the distributor and retailer activities for AT&T after divestiture.

AT&T enters 1985 with a widely praised unannounced product, the Safari 4, which may be called

(Continued on Page 30)

Unix has some serious drawbacks, and a cautious manager will make sure they don't harm his company.

By Aaron Goldberg

One of the most amazing stories in the computer industry is the headlong dash to adopt some sort of Unix. A person with my less-than-enthusiastic view of Unix might be tempted to mutter about fools rushing in and so on. Nevertheless, observers who take an objective view of Unix and its implications for user organizations may find themselves having a number of serious misgivings.

Perhaps the only way Unixphoria will end is with shattered dreams, careers and information management plans. However, the thorough and well-informed information processing department may find shelter from the storm. I do not mean to imply that there is absolutely no place for Unix. Rather, like any other product within the industry, it has finite and limited uses.

Probably one of the most important elements of the Unix decision is to examine the weak points of the operating system; the strengths and promises of the environment are well enough known. Among Unix' most critical shortcomings are the following:

- There is no standard version.
- System manufacturers have reinvented much of the basic operation of the system to make it suitable for commercial applications.
- Few and limited compilers exist for major languages like Cobol.
- Speed (or, more precisely, lack of it) is an issue.
- The industry awaits with trepidation a statement on IBM's position.

Each of these factors will be examined to provide details on why those perceiving Unix as the panacea for DP woes will be disappointed.

Much of the advertising related to Unix standards seems to reflect hope rather than fact. At this time, there is no single standard of Unix or its derivatives. At my last count, more than 12 different versions of Unix existed, and there are probably more. This adds up to a very confusing environment for the OEM, end users and even the manufacturers. If Unix were designed from the start to understand the importance of files and records, this situation would be somewhat less aggravated.

The reality of the environment is that the bulk of the low-end vendors (IBM, Altos Computer Systems, Inc. and Tandy Corp.) are adopting Microsoft Corp.'s Xenix. What makes this interesting is that the Xenix implementation is not yet compatible with System V, which AT&T is pushing. This certainly covers the major players in the commercial side, but the question of the technical systems must also be settled. This is the primary

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the 7300 after release. The 7300, according to specifications in the Federal Communications Commission report filed by codesigner Convergent Technologies, Inc., appears to be the first major Unix personal computer product. The 7300 should spur large end users to purchase Unix-based equipment for the first time. In addition, the product's telephony capability should prove extremely popular among medium-size corporations and among office workers in large corporations.

Where are the weak points of AT&T's computer strategy? The first that would have to be pointed out is distribution. The value-added reseller agreements required by AT&T are financially taxing for small system integrators and resellers. AT&T must rapidly develop a two-tiered distribution channel to promote sales of its low-end products to small system integrators and retailers. Otherwise, it will lose a valuable part of the market. Watch for AT&T to sign more retailer and system integrator deals in the near future. Over 30 distributors have been signed, and that number should increase to as many as 1,000 if AT&T is to penetrate the market.

AT&T has made several important moves in 1984. It has done all of the following:

- Conformed to the /usr/group standard for Unix System V.
- Introduced record and file locking.
- Introduced an application software interface standard so that third-party application software vendors can make their products run under System V and know they will remain compatible with future releases of System V.
- Introduced a line of computer products.
- Begun the massive training of a 5,000-person sales force and 22,000-person support team.
- Undergone several massive reorganizations to focus the company more on marketing and clients.

These actions all required a great deal of energy, money and commitment. However, AT&T must make many additional moves in 1985 to maximize its end-user sales and its impact in the computer industry.

Among them are the following:

- Introduce a standard user interface to Unix.
- Communicate much more clearly with application software developers about future releases of computers and software products in order to let them prepare for the product in the market.
- Vastly improve their manuals, training and support materials at least to reflect the standards maintained by their competitors.
- Implement a two-tiered system of distribution that allows small system integrators and value-added resellers to sell AT&T products without a heavy financial burden.
- Eliminate the end fighting that still exists from the Technologies and Information Systems separation.
- Take on less of the "not-invented-here" attitude about improvements and enhancements to Unix, application software, training and support materials and related products.
- Develop and release a distributed version of Unix to offset the Sun "sockets" distributed Unix that threatens to refragment the Unix standard.

Distributed Unix is extremely important to hardware and software vendors and to end users. IBM is anticipated to introduce Personal Computers networked to System 36 and other proprietary IBM computers. Developing a networked Unix — a Unix standard allowing a multivendor solution to networking — is imperative. If AT&T does not define a distributed Unix that allows several vendors' computers to communicate and exchange files, the Sun Microsystems, Inc. network may become a de facto standard, fragmenting the control of Unix again.

The 1985 Unix market may see the fallout of up to half of the Unix-related hardware manufacturers. Many startup companies that offer products today will be out of existence within 18 months as the big vendors such as DEC, HP and AT&T enter the field with bigger budgets

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for advertising, service and support and software. The Unix fallout should be most severe at the supermicro level, where a plethora of 68000/Unix computers compete for the same system integrators, value-added retailers and end users. The high level of government purchases of Unix computers in 1984 will continue in 1985. However, small companies may find themselves locked out of the government contracts they previously won before companies like AT&T and HP entered the competition for these key contracts with unmatchable pricing.

IBM's introduction of personal computer upgrades and networks of personal computers to proprietary IBM file-server products will push the demand for multivendor network solutions that compete with IBM's proprietary products. Although much activity will center on copying IBM's proprietary networking configurations, many vendors will look to Unix to provide cross-vendor compatibility. By offering cross-vendor network ability and application software compatibility, vendors can hope to achieve a large enough installed base to provide strong competition for IBM's proprietary products. As this push for standardization accelerates, the Unix phenomenon will grow stronger. At this point, Unix is probably *the* alternative to copying IBM's proprietary operating systems.

Applications software will grow for the Unix market in 1985, pushed largely by the impact of the PC 7300. Over 100 application software vendors have Unix-based products that exist in some state of completion and are designed to target the high-end personal computer and general business and personal productivity markets. This mainstream Unix application focus, previously nonexistent, will be possible because of the large installed base of 7300s and competitors in 1985 (as many as 80,000 units). Unix application software for vertical markets continues to grow rapidly. The largest and most clearly established Unix vertical market is the engineering and scientific area. Unix-based computer-aided design and manufacturing software, engineering and programming tools and fourth-generation/application artificial intelligence products are all available today, and the Unix trend continues.

The Unix phenomenon has been stronger in some markets than others. It is well established in the engineering and scientific area, in the programming-oriented high-end supermini to low-end mainframe area and in certain vertical areas such as the university, research, government/military and banking areas. In the general personal computer market for small business and office automation, the success of Unix is more speculative. It will, however, grow with AT&T as the driving force in that growth, backed by the MS-DOS-to-Xenix connection and the need for cross-vendor networking. ≡

Yates is founder and president of Yates Ventures, Inc., a market research firm based in Los Altos, Calif.

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(Continued from Page 29)

domain of the 4.2 Berkeley version of Unix. Once again, the commercial and technical markets are segregated. To this mix of AT&T vs. Microsoft, add the potpourri of smaller vendors that offer additional versions of Unix. Although converting a C language program among some of these different systems sometimes takes no more than a recompile, many times it takes significantly more.

Those who are taking a wait-and-see attitude and hoping that some standard will emerge in the market should be advised that the odds are long. Today's software developer wants and needs the most advanced capabilities in the basic operating system to allow his product to perform and provide the utmost in utility. To follow the advice of many Unix gurus, the developer is told to use the limited common subset of utilities found between System III, V and 4.2. Berkeley — hardly the state of the art. One of the most interesting aspects of the question "What is a Unix?" is that IBM is in the enviable position of possibly being able to "control" AT&T's "standard."

Nor is the only problem deciding what type of Unix to use. Put yourself in the system manufacturer's shoes. After a couple of years of work and many millions in venture capital, the day arrives when the system works for the first time. After the initial joy and incredulity subside, the next reaction relates to the speed. Again the reaction is surprise. One wonders how a computer can run so slowly. Now the task is to take this system and make it perform better than a Commodore 64 (no offense meant to the 64). Much to their credit, companies like Plexus Computers, Inc. and Fortune Systems Corp. have succeeded by tuning the hardware, adding special-purpose processsors for I/O and other functions and, in some cases, segmenting the operating system to achieve performance. As this tweaking goes on to get real minicomputer class performance, some of the portability is lost.

This also brings up an interesting ancillary point: building Unix systems is not so easy as getting chips from Motorola, Inc. source code from AT&T, disks from Priam Corp. and terminals from Wyse. The two companies mentioned before, Plexus and Fortune, deserve a lot of credit. They actually have working stable systems that run Unix and that don't suffer from monthly hardware stoppages. The fact that companies advertise and even sell a product is no guarantee the system actually works.

Another interesting issue is represented in the language environment. Sure, C and Unix is a better combination than TSO and Cobol. So what? How many of your application systems are written in C? How many in Cobol? The commercial market is a world where Cobol is the major language for applications. Even if you decide that Unix and C form a much better development environment for all new applications, remember you have to run the old ones somewhere. Of course, the user can always buy enough equipment to support an additional Unix environment. Think how much fun adding an entirely new operating environment would be.

Right now, the quality and variety of the compilers for languages that run under Unix is not what it should be, and there is no guarantee things will improve. I think the availability and quality of languages will increase in the future. Think how long it has taken an environment like MVS to get to its relatively workable state *with* IBM's blessing and resources.

For those with an operational perspective on systems, one of the most important requirements surfacing today is the need for additional speed and system capability. And here Unix has some serious drawbacks. Because Unix was designed long before the concept of virtual memory was a given and well before batch became a nasty word, there are some speed limitations. This does vary widely according to vendor.

The final argument against Unix is IBM's position — or lack of it. Even the colossus itself appears unsure. In Austin, IBM markets two products, VM/IX and PC/IX, both derivatives of Unix System V. A trip 1,000 miles to the east brings one to a division with not-so-small impact (Entry Systems Division in Boca Raton); there, Xenix has been named the multiuser operating system. Again, the user is caught between a rock and a hard place: If you bet on a direction now and you're wrong, limitations will be your legacy. If you guess right, there still won't be any parade. There is a third option: Why bet at all? You're looking at serious capital outlay and major impact on information system capability for the future, and this may not, in fact, be a chance you're willing to take. Eventually, IBM will have to take a position on Unix, even if it is a minor part of the market. IBM's stake could, however, be to ignore Unix, leaving it in a sort of limbo. It does appear that the prudent user may decide that now is not the time to get cut on the "leading edge."

Of course, I believe Unix has a place in the market, and it is likely to be significant (meaning between 5% and 20% of the total market for systems). Nevertheless, Unix is not and cannot be the panacea it is proclaimed to be. For those insistent upon moving down the uncharted Unix road, I can offer only one comment: "The nice thing about hitting your head against the wall is that it feels so good when you stop." ≣

Goldberg is director, microsystems services, International Data Corp., Santa Clara, Calif.

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A Bridge to SNA

By Vic Forgetta and Tom Clark

Before Unix can succeed in the corporate market, a Unix-to-SNA gateway is needed.

As decentralized processing becomes more popular, an increasing number of multiuser systems will be found in the distributed end-user environment. The trend toward multiuser processing is occurring because it is highly efficient and cost-effective in situations where many users need access to common and consistent data for various applications.

Unix is on the way to becoming the supermicro operating system standard for the multiuser environment; installations already number up to 95,000 and are expected to increase to 500,000 by 1987. To date, the primary Unix buyers have been the Fortune 1000. Many of these companies conduct distributed processing activities to reduce host overhead while still maintaining a central corporate data base on an IBM host. Regardless of their degree of processing independence, regional offices require some access to the corporate mainframe to update information, share data and maintain consistency throughout the organization.

IBM's System Network Architecture (SNA) is the de facto networking standard in the IBM world, and the need for a Unix-to-SNA gateway is clear. If Unix is to become dominant in the corporate market, it must have the ability to communicate with SNA networks and provide users with access to mainframe applications. The Unix-to-SNA gateway should not restrict normal Unix processing in order to provide this communications capability. Rather, it should provide a transparent and common gateway to the IBM environment.

Protocol converters were one of the first methods used to connect Unix systems to SNA networks. Commonly called black boxes, these devices provide basic asynchronous to synchronous protocol conversion.

Protocol converters can be used in two ways: they can be positioned either locally to the host or remotely with the Unix system.

In the first situation, the protocol converter is an extremely cost-effective solution that allows the converter to be shared by multiple devices by means of dial-up lines. However, when the protocol converter is positioned near the host, most communications between the host and Unix system are asynchronous. Asynchronous communications is a slow process, operating at 1,200 bit/sec or 2,400 bit/sec. It permits screen painting character by character only, rather than in blocks. In addition, because error-correcting facilities are lacking, highly sensitive data may be compromised during transmission.

When the protocol converter is positioned near the Unix system, most of the communications is synchronous; offering increased data accuracy and speed. In this configuration, however, the device is much less cost-effective; the converter typically supports fewer devices than if the converter were positioned locally to the host.

In general, protocol conversion is an extremely restrictive method for establishing the Unix-SNA connection. Converters typically use a single protocol, emulating a 3270- or RJE device. In addition, protocol converters greatly limit the Unix system by reducing it to an unintelligent terminal. By simply emulating a terminal, interactive processing and file transfer capabilities are severely restricted.

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As the demand for distributed processing increases, the demand for sophisticated communications capabilities will also expand. In light of the protocol converter's limitations, a more intelligent communications solution, such as software emulation, will be required for Unix systems.

Software emulators reside on the Unix system and provide multiple protocol, cluster controller (Physical Unit) and device (Logical Unit) emulation. Users can access many different hosts and choose between interactive and batch file transfer. With software emulators, the host connection is synchronous, and line speeds typically operate from 4,800 to 9,600 bit/sec. Few software emulators currently exist for the Unix environment, but this will change as Unix continues to expand in the commercial market. As these products become more abundant, users may want to consider several important features.

The most important feature in the design and selection of a software emulator is the quality of the SNA implementation. A solid SNA design means the Unix system will be able to emulate multiple control units (Physical Units), multiple display stations and printers (Logical Units) as well as multiple protocols (SDLC and BSC).

With these capabilities, the system can access a variety of hosts, such as the IBM 370, 4300 series, 3800 series and Series 1; host applications — CICS, CMS and TSO/SPF; a variety of operating systems — OS/VS, VM and DOS; and numerous access methods — Vtam, Btam and Tcam.

By emulating an IBM cluster controller, the Unix-SNA software allows the Unix system to support up to 32 concurrent host communication sessions available to any user on the Unix network in any combination of printers or displays. If the Unix system's memory permits, additional controller emulations will be able to run.

A solid SNA implementation should be extremely flexible, permitting simple configuration of physical and logical units to the SNA network. This flexibility includes the ability to store parameters so that reconfiguring is not necessary when multiple hosts are accessed. In addition, a full SNA implementation should supply display handling routines to access the Unix Termcap, a data base that defines, stores and manages all of the Unix system's terminal and printer device parameters. With this capability, the software emulator supports any device attached to the Unix system. If Logical Unit configuring is flexible, printers, for example, can be defined as either local, host-dedicated or shared printers. This is particularly advantageous for decentralized offices that require host printouts on site. Print jobs can be initiated from the host system and printed locally at the same printer used for normal Unix processing. In addition, host print data can be directed to disk or diskette for manipulation at a later time.

With the best software implementation, all host communications activities are transparent, so that the user works only with the desired Unix application. One example of this user transparency is the ability to interface Unix-based application software with communications software. A correctly designed emulation package should include routines for this interfacing.

In light of the protocol converter's limitations, a more intelligent communications solution, such as software emulation, will be required for Unix systems.

For those familiar with the SNA environment, the software also should be user transparent by providing all the capabilities of the IBM equipment. The Unix software product should allow the user the same screen, print and keyboard formats used in the application environment.

In addition, a Unix-SNA gateway that represents a solid SNA implementation will be able to expand quickly to accommodate enhancements made to SNA. A modularly designed software package that is an accurate implementation of SNA is extremely easy to maintain as well as enhance, since blocks of code can be replaced without disturbing other layers.

SNA's latest enhancements permit peer-to-peer communications and for the first time use the processing power of the Unix system. Rather than defining it as an unintelligent terminal, SNA assumes the Unix system is intelligent. This greatly increases throughput as less instructional information is sent with the datastream and a variety of instructional code can be interpreted.

Enhanced Unix-to-SNA communications clearly will affect the growth of distributed multiuser environments in the corporate arena. A gateway that can accommodate current and future communications requirements and make use of future technological advancements will greatly reduce host overhead and contribute to true, intelligent decentralized processing. ≡

Clark is OEM sales manager and Forgetta is product planning manager with Pathway Designs, Inc. in Wellesley, Mass., a hardware/software manufacturing firm.

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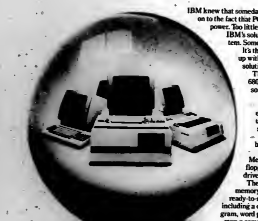

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AT&T Searches For Standard Status With System V

By Anne Lovett

Rapid change and uncertainty characterized 1984 for newly divested AT&T. The company was free to enter unregulated markets, specifically the data processing sector. AT&T Information Systems (Attis) — its unregulated equipment division — announced its own line of computer products known as the 3B family. With low market share and installed base, AT&T's short-term impact in the computer market will not be significant. However, there is no doubt AT&T is a serious long-term player with strong financial resources to back up its commitment to becoming a strong force in this arena.

The 1982 Consent Decree marked the settlement of the U.S. Justice Department's antitrust suit against AT&T and required the company to divest itself of approximately $100 billion of assets (the Bell Operating Companies). At the time of divestiture, Jan. 1, 1984, the high-tech world exulted that finally there would be a company with enough resources, clout and technology to provide an alternative to Big Blue. Furthermore, the company combined those qualities with another unusual one — a clean slate. On paper, the likely strategy of the giant phone company appeared unbeatable — private branch exchanges, minicomputers, personal computers, terminal phones, networks and so on, all linked neatly together with Unix. In reality, however, the company would make many of the same blunders made by companies that had pioneered in the markets. After all, AT&T was an enormous, slow-moving organization where short-term strategy usually meant the next five years — representing a longer span of time than most of its current competitors' existence.

The strategic importance of Unix to AT&T cannot be overstated. The operating system — always described as highly portable — has been moved quickly from public domain software to part of AT&T's marketing arsenal. As AT&T's best claim to fame in the computer world, Unix also represents AT&T's best chance to penetrate Fortune 1000 accounts.

Developed at Bell Laboratories in 1969 for internal use, Unix was offered to the outside world only after descriptions of the operating system had been leaked to non-AT&T hackers. Distributed through Western Electric Co., Unix was offered cheaply to universities and more expensively to commercial entities. Support was not available for either group.

AT&T has changed its tactics — from years of no advertising, no press releases and no support of Unix to a vigorous advertising compaign for the product.

The former lack of promotion in fact created a "bottom-up" push for Unix, with programmers lobbying heavily in their companies for Unix; current marketing efforts, however, indicate a top-down approach. A typical full page *Wall Street Journal* advertisement has the word Unix covering half a page with the question, "Is it based on Unix System V?" superimposed. AT&T must convey two messages to current and potential users. These messages are as follows:

- The importance of Unix System V as a standard that is here to stay. (This assertion is being supported by many third-party vendors.)
- The importance of buying Unix directly from the company that made it all possible. This second task is more difficult. AT&T will face competition from third parties that have developed enhanced versions of Unix System V. For example, Microsoft Corp. which now sells Xenix, a System III-based operating system, will not sit idly as System V takes over. Instead, Microsoft can be expected to introduce a "Xenix V" product, capitalizing on both Xenix' and System V's notoriety.

Users can expect that AT&T will continue to enhance Unix, but will bring its installed base along, providing free or low-cost upgrades or paths. Users can also count on AT&T's continuing to label its Unix offering "System V," although that umbrella will be shared with many new releases.

Further supporting the standardization of System V, AT&T recently announced the AT&T System Interface Definition (SID). SID specifies a minimum set of system calls and library routines that should be common to all operating systems based on System V. The announcement is significant not only because it promotes more standardization, but also because AT&T agreed to abide by the guidelines of third parties, most notably /usr/group, in establishing its own interface definition.

The publicized purpose of SID is a high degree of portability of applications, allowing users to protect their software investments even when they change hardware. Clearly, however, AT&T benefits from increasing standardization of Unix, as a means of preventing other companies — most notably IBM — from controlling or establishing standards for Unix or a Unix lookalike.

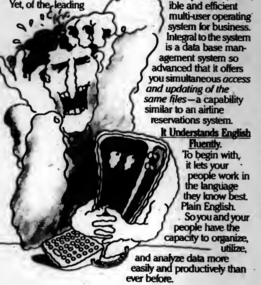
AT&T considers itself the custodian of Unix and recognizes the necessity of providing a clear and logical statement of direction and commitment to Unix. Intrinsic to its success as the standard operating system provider is the absolute requirement that AT&T prove itself an able caretaker of Unix System V without scaring off users by manipulating the operating system blatantly to its own advantage.

Just as Unix is touted as the glue that can hold a user's disparate machines together, Unix is the cohesive force behind AT&T's own hardware lines. AT&T was in an unusual position at the time of divestiture — a mature, well-financed company possessing incredible technology and research capabilities. The industry expected AT&T to unveil PBXs, minicomputers from the 3B series, personal computers, terminal phones and networks all at once and all running Unix System V. Instead, the company has introduced products in a slower and more confused manner than anticipated. Although a unified systems strategy exists, it is being implemented slowly. At times, the connection between AT&T machines seems more like a footbridge than a freeway.

When AT&T's PBX System 85 was introduced, its applications processor was 8086-based and ran a modified version of Unix, leaving many people questioning why 3B processors had not been used and why anything but pure System V had been offered. Bringing its system strategy into better focus, AT&T finally endowed the System 85 with the 3B5 AP, a mid-range 32-bit computer with an AT&T WE32000 microprocessor, running System V.

AT&T sees itself as Unix' custodian and recognizes it must provide a clear statement of direction. It must prove to be an able caretaker of System V without scaring off users by manipulating the system to its own advantage.

For current and potential users, a clear PBX strategy is essential. The PBX products are AT&T's flagship products, to a large degree because of the enormous installed base of the company's older PBX. Just as "no one ever got fired for buying IBM DP equipment," AT&T telecommunications equipment was always a safe bet. Major companies' current moves to coordinate the buying decisions of DP and telecommunications equipment greatly aids AT&T's push to merge voice and data networks and equipment. However, IBM's recent purchase of Rolm Corp. is a setback for AT&T because the company now loses much of its uniqueness.



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> **An increasing amount of Unix applications software will be available from AT&T, but users will have to proceed cautiously. In its massive software procurement program, AT&T runs the risk of slipping up on quality control.**

In June 1984, AT&T joined the multitude of vendors offering a personal computer compatible with IBM's Personal Computer. Initial reaction was one of mild confusion — the originator and now main promoter of Unix offering an MS-DOS machine? With so few applications available for Unix on a personal computer, AT&T needed to take advantage of the prolific application software for MS-DOS. Upon closer scrutiny, the product may be viewed as a strategically positioned bridge, embracing MS-DOS while encouraging occasional or partial use of Unix. Two products form the keystone of this bridge:

- The PC Interface, which costs $100, was actually announced in January 1984 as a 3B product. MS-DOS users can connect to a 3B2 or 3B5 for data transfer or storage or to function as a Unix workstation.
- The Context Switch, which costs $100, allows PC users to move from MS-DOS to Unix by flicking a switch. Because the MS-DOS application is frozen, the user can return directly to the application when he goes back to MS-DOS. Furthermore, certain Unix utilities (such as Spell) can be run on MS-DOS.

AT&T's 7300 PC from Convergent Technologies, Inc. (which has been code-named Safari 4) comes almost as an answer to those who criticized AT&T's introduction of an IBM-compatible personal computer. Scheduled for introduction early in 1985, the 7300 runs System V and has a built-in modem and two separate telephone lines for voice or data. With its rumored above-average integration of computing and telephone, the 7300 will be a good second personal computer product for AT&T; a 3B-based PC is not far behind, as AT&T moves methodically toward its integrated systems strategy.

Ironically — but understandably because of regulatory handcuffs — the company responsible for developing Unix has virtually no applications software of commercial quality. AT&T has worked doggedly to enter into agreements with software companies to develop Unix applications packages.

The decision to sign up Digital Research, Inc. to provide a library of applications software for Unix seemed at first an excellent idea. Unfortunately, the deal has turned into an embarrassment for AT&T management. Although the applications software will eventually appear, the lack of timeliness is damaging to AT&T. Now more than ever, AT&T is encouraging software vendors to join AT&T's Unix Systems V bandwagon — and will continue to do so. The company has taken several tacks, forming:

- AT&T Venture Group — to invest in small business startups.
- AT&T Software Procurement Program — to handle third-party software arrangements. This group is part of Attis' headquarters group in Morristown, N.J. Accepted products are given varying levels of support. The range of this support is quite wide: it may be a listing in an AT&T software catalog (scheduled to be available in hard copy in December 1984 and in an electronic version during the first half of 1985), or distribution without support or the purchase of a license from the software vendor and full support of the product.

In August 1984, Attis formed a Major Accounts Special Systems Group. This organization of software specialists provides technical expertise to major account (Fortune 500) sales teams. When a sale of 3B hardware has been made, this group provides customized applications for the client's particular vertical market. In its early stages, this group will rely on internally developed software programs. Positioned as a "loss leader" service to establish credibility for AT&T on office automation, the offering is reminiscent of IBM's handholding for large accounts in its early days. Unfortunately for users, once established in new markets, companies like IBM and AT&T can no longer afford this initial level of support.

Although an increasing amount of Unix applications software will be available from AT&T, users will have to proceed cautiously. In its massive software procurement program, AT&T runs the risk of slipping up on quality control. At least initially, software programs with the AT&T stamp of approval should be scrutinized carefully for their own merit.

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nology or of technological innovations. It has, however, been plagued by an inability to bring products to market, having cultivated an environment of pure research at Bell Labs — independent of any marketing influence. This technology-driven aspect of the company slowly is changing to meet the challenges of unregulated markets. Hiring experienced computer salespeople has helped. The next, more difficult step is to promote a more coordinated effort between these non-AT&T-trained professionals and the central support staff that has been heavily indoctrinated with the corporate culture of yesteryear. Without improved communications and the sharing of common goals, these two groups will continue to be somewhat at odds with each other, and the users will suffer from it.

> **Queries such as "Why buy Unix from anyone else?" attempt to appeal to users' common sense. AT&T must go one step further and persuade users why they should buy Unix from the company that created it, yet left it orphaned for years.**

Marketing will continue to be AT&T's major focus in the next few years as the company strives not only to learn about marketing, but also to unlearn its past methods of operation. Moving to become more international in scope, AT&T can be expected to set up more offices abroad, as it did in Tokyo, to promote a standard AT&T Unix in Japan.

AT&T will continue to buy hardware and software products where appropriate, seemingly having conquered the "not invented here" complex — or at least having put it into remission. A tremendous number of software companies will be signed up to provide Unix applications and tools. The result may not be completely positive, but could also present difficulties in quality control and product differentiation.

As the gatekeeper of Unix, AT&T will probably try to position its 3B machines as the standard front-end processors to IBM/Unix mainframe systems. It is here that AT&T will square off with IBM. AT&T clearly must leverage its communications expertise, particularly its PBX integration with its DP environment. Emphasizing voice and data integration as a major reason to buy its products, AT&T will focus development efforts in this area and will introduce several important products in the next two years.

The company will seek to capture a larger and larger portion of the Unix "after market," particularly in training, where it already has an excellent reputation. AT&T is already actively promoting its own Unix training, proclaiming that "for 15 years, we've taught our own people to use the Unix System. Now we can teach yours."

AT&T is currently promoting the hardware independence of Unix as the savior of end users; a recent AT&T press release stated, they will be "free from the tyranny imposed by proprietary operating systems." However, the company must push its own hardware vigorously and will be forced to reveal a strategy that in some manner locks users into AT&T machines. Among the possible tie-in strategies are the following:

- Free or cheaper updates to System V for 3B Series users.
- Free seminars or training sessions for 3B/Unix users.
- Controlling the user interface by embedding it in 3B firmware.

To soften the blow, AT&T will try to convince users that they always will be able to move around a large AT&T family of hardware without worry — unlike the situation confronting IBM users.

AT&T must guard its role as custodian carefully, not overstepping the bounds and appearing as owner, director or manipulator. The company will continue its efforts to appeal to users' common sense with queries such as, "Why buy Unix from anyone else?" AT&T, because of its short history in DP, must go one step further and persuade users why they should buy Unix from the company that created it, yet left it orphaned for years.

The next few releases of Unix will be important signals from AT&T. Formerly the company had little motivation to improve the commercial version of Unix and left such undertakings to the University of California at Berkeley and others. Now, however, AT&T is a company with a mission. Users can only hope that it is also a company with vision. ≣

Lovett is principal of Avenir Associates, a software consulting company located in Boston.

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IBM Takes a Look at Unix – *Now* What Happens?

By Glenn Rifkin

A technology is introduced. The media takes a look, the analysts analyze. A bold user gives it a try, then another and perhaps another. The technology begins to gain momentum and approach market status. Suddenly, a giant shadow is cast over the new environment: IBM is interested. Big Blue takes a look; its analysts analyze. A roomful of pinstripes murmurs and nods in agreement and the magic wand passes over the technology. IBM has given its approval; legitimacy is bestowed. The scramble begins.

The scenario is a familiar one in the computing industry and seems to be happening once again with Unix. This time, however, IBM's approval has been tepid at best, and its impact on the Unix market remains unclear. Though IBM has made several strategic moves toward various versions of Unix, consultants agreed the world's number one computer maker is still unwilling to pass the approving magic wand over the operating system. IBM's perfunctory offerings of Unix, they said, are merely stopgap solutions that will eventually be played off against IBM proprietary operating systems.

"I view [what IBM is doing] as an interim toe in the water," said Dale Kutnick of the Yankee Group. "IBM wants to pump out iron and get people on its own operating systems, but if the market is going in another direction, IBM wants to be there."

"IBM's commitment to Unix so far has been very slim in comparison to what they could do if they wanted to," added David Fiedler, president of Perchwell Corp., a market research firm specializing in Unix.

For Unix backers, IBM's lukewarm response to Unix has not caused a panic. For one thing, another marketing titan, AT&T, is solidly behind the operating system and pushing hard for its acceptance as a standard. And, more important, Unix is already at the core of a legitimate and thriving market, a business built without IBM's blessing. According to Bob Marsh, president of Plexus Computers, Inc. and a founder of the Unix /usr/ group, the Unix market has had a good, solid underpinning for five years, and it is the media that has been looking for a problem that isn't there.

"In terms of the OEM, multiuser marketplace, there is a solid on-going business built around Unix," Marsh stated. "Some people believe that because it hasn't exploded like the personal computer market, Unix is a market wandering around looking for legitimacy. The truth is that it was a $1 billion market in 1983 and close to $2 billion in 1984. There are 100,000 Unix-based systems out there with eight to 10 users per system — that's the equivalent of a million personal computers being shipped. That's not a wandering-around market."

Nonetheless, an IBM stamp of approval on almost any technology generally creates an insatiable appetite in the marketplace. It not only fills IBM's coffers, but also generates a whirling mass of third-party enterprises that spill off into the far reaches of the computer business. The difference between a tacit IBM push for Unix vs. an all-out major support effort can mean many billions of dollars for the Unix industry.

It's ironic that IBM is not a neophyte in the Unix world. IBM has also announced several different versions of the operating system for diverse parts of its product line. In early 1983, IBM offered a Unix version for its Series/1 minicomputer (only to a limited customer set); even before that, IBM Instruments had developed a version of Microsoft Corp.'s Xenix for the IBM 9000. The company has also offered Unix for the VM environment — specifically for the 4300 supermini — to customers with "special requirements."

In January 1984, IBM went one step further and unveiled the PC/IX operating system for the Personal Computer XT. The Unix-based system was developed for IBM by Interactive Systems Corp., which reportedly has a VM/IX version ready to be announced.

IBM's most serious Unix offering, however, is PC Xenix for the recently introduced Personal Computer AT. PC Xenix, developed by Microsoft and based on Unix System III with Berkeley enhancements, is scheduled to be shipped this month and, according to consultants, represents the company's strongest commitment yet to Unix.

"The PC AT with Xenix will be a significant product," Fiedler said. "Even so, that won't be the major operating system IBM is putting on the AT."

Nonetheless, some still speculate that IBM's forays into Unix thus far are quite promising. Marsh pointed out that by targeting Unix-type operating systems for so many parts of its product line, IBM may well be "positioning itself to have, for the first time, a single operating system across all its equipment. I wouldn't be surprised if there were elements within IBM who point to [Unix] as an opportunity to tie things together and get some consistency in their products that they've never had."

Most IBM watchers, however, disagree. Though IBM is offering versions of Unix, its primary support continues to be of its proprietary operating systems. According to Kutnick, IBM won't ignore Unix in its larger systems, but instead will "play it off" against its VM operating system. In other words, offer Unix, but push VM.

One key reason for this is software. "IBM's software revenue is increasing at 50% a year, and they don't plan on giving that up," Kutnick stated. "If their base demands it, they'll support whatever they need to support. But they'll try to offer alternatives. VM will be the major alternative IBM will offer against Unix."

As usual, speculation about IBM's actions abounds. Industry consultants have attributed the company's less than enthusiastic approach to Unix to many things. Some believe IBM doesn't want to legitimize the Unix industry for its rival, AT&T, which would certainly benefit from a hearty Blue endorsement of Unix. Others comment that IBM was just caught by surprise by the sudden interest in Unix and simply hasn't decided how to respond.

Analysts agreed that IBM's first tentative moves toward Unix have been a response to pressure from segments of its customer base and that the company is taking a "wait and see" stance in relation to a long-term market reaction to Unix.

"I really don't see Unix as being integral to their product strategy," stated Mike Ursino, president of Technology Services Corp., a consulting firm in Bellevue, Wash. "They see it as an opportunistic market — a way to extend applicability of their product offerings to markets where they might not otherwise be considered applicable. Their real strategy is unfolding now, and that is to more and more be able to integrate their PC offerings with their mainframe offerings."

> **Some consultants believe IBM doesn't want to legitimize the Unix industry for its rival, AT&T, which would certainly benefit from a hearty Big Blue endorsement of Unix. Others say IBM was simply caught by surprise and hasn't decided how to respond.**

IBM itself does not speculate publicly about future direction, but Pat Kearney, director of programming for IBM's Information Programming Services group, admitted that the company is exploring further avenues with Unix. "We are actively supporting Unix," Kearney stated. "Our customers are asking for it and we see it

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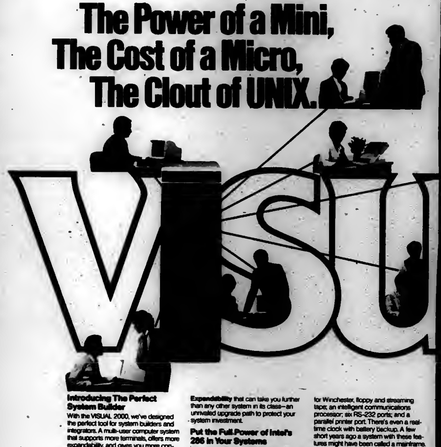

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as a significant business opportunity." Mike Reisman, an IBM spokesman, echoed those sentiments at IBM's Boca Raton, Fla., Entry Systems Division, where the Personal Computer line is produced: "We have made a sizable continuing commitment to PC Xenix as a multiuser, multitasking operating system for the PC AT."

> **By adopting Xenix over System V, IBM can keep the many different flavors of Unix flourishing and set up what one consultant called the "FUD syndrome" — fear, uncertainty and doubt. When the market is in that position, it looks to IBM.**

Though IBM has made this commitment to Xenix on the AT, some consultants don't believe this indicates any great affection for Unix on IBM's part. According to Kutnick, IBM announced Xenix on the AT simply because the latest version of PC-DOS (version 3.1) wasn't ready and when it is, IBM will push 3.1 over Xenix. Xenix, on the other hand, has been operational on Intel Corp.'s 80286 chip for more than a year and was the only commercially available alternative.

"PC-DOS 3.1 with the network program will get you beyond what Xenix can do for you in the PC environment," Kutnick explained. "Their topograpical philosophy will look like a lot of PC workstations on a network clustered around an IBM host as opposed to going with Unix," Ursino said.

James Sullivan, a senior analyst for Yates Ventures, a consulting firm in Los Altos, Calif., also pointed out that the AT is not truly a Unix machine because it supports only three users. "This is not a true multiuser, multitasking machine. You only get real benefit out of Unix with from four to 16 users."

In addition, Ursino pointed out that IBM looked to Xenix because "it's still not possible to have a normal OEM relationship with AT&T like the one you can with Microsoft." In terms of the kinds of support and services that could be contracted for and the kind of response a customer can expect, that is still not available from AT&T, Ursino said.

He said two other points were also relevant: AT&T has still not announced a firm date when they will introduce a 286 version of System V Unix, and Microsoft has added a substantial amount of value to Xenix to make it more appropriate for the personal computer marketplace.

By opting for Xenix, IBM puts a substantial crimp in AT&T's plans to make Unix System V the industry standard, and that move has not gone unnoticed. "They wanted to slap (AT&T) in the face and scare them a little," Fiedler said, "but the way IBM works, they are less inclined to worry about slapping faces and more likely to think that this is a way to make the most money."

Sullivan added that by adopting Xenix over System V, IBM can keep the many different flavors of Unix flourishing. By adding to the confusion, Sullivan said, Big Blue sets up "what I call the FUD syndrome — fear, uncertainty and doubt. Whenever the market is in that position, it looks one way — to IBM."

Ironically, according to Kutnick, IBM already has Unix System V running internally on its Personal Computer AT as well as other proprietary processors. "They have no intention of offering it commercially yet," Kutnick declared.

Although IBM may not want to tip its hat to AT&T and set up the Unix market, it is more likely that it is simply following a strategy similar to that of other computer makers such as Digital Equipment Corp. and Data General Corp.

"You've invested all this money in proprietary operating systems and that effectively locks users in," Kutnick said. "You don't want a portable operating system — even though Unix is not as portable as people purport it to be — because you don't want people

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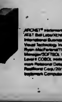

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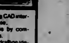

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migrating processors capriciously. So I don't see any of those vendors supporting Unix actively."

Even with just tacit support, IBM's nod to Xenix has been a welcome opportunity for Microsoft. Jerry Dunietz, senior systems engineer at Microsoft, commented, "Since IBM'a announcement, interest has really taken off, largely because a lot of companies that didn't have definite Unix plans now do.".

Xenix, in fact, was already the best-selling version of Unix, with more than 77% of all Unix-based CPUs in the $6,000 to $12,000 price range, according to Yates Ventures. IBM's endorsement of Xenix, beyond stimulating booming sales, has helped push Xenix to standard status, Dunietz pointed out.

> **Even if just tacit support, IBM's nod to Xenix has been a welcome opportunity for Microsoft. Beyond stimulating booming sales, that endorsement has helped push Xenix to standard status.**

"The biggest problem in the so-called Unix market is that there hasn't been a Unix standard by which a vendor can publish packaged software," Dunietz explained. "The reason for that is there is no real binary portability standard and no media compatibility standard. So even though many systems are derived from Unix, every single one of them requires a different physical package and a different disk with different bits on the disk to get the same program running on that system.

"With the 286 microprocessor and IBM's endorsement of Xenix, that problem has been largely eliminated. With 286 Xenix, you get binary portability of applications. I think that, just as we have a media format standard in the DOS world, IBM will set the media standard in the 286 Xenix world. At that point, software vendors can publish one piece of software that will run on IBM hardware and on other vendors as well."

For third-party software developers, the status of Xenix may not be quite that crucial. Jit Saxena, president of Applix, Inc., a Southboro, Mass. software house, admitted that Xenix on the AT will be a strong factor and will attract third-party software developers simply because of IBM's presence.

But the version of Unix is just not that crucial, he said. "Somebody who is playing the hardware add-on game might be a little more sensitive to it, but we are developing applications that fit on top of the operating system. To us, there are minor differences between Unix flavors that we can easily adapt to," said Saxena.

For the management information systems (MIS) director, the interest in Unix should be welcome, Saxena pointed out. "Even though Unix has some minor problems right now, I'm sure [the MIS director] is dealing with systems that are completely different: mainframes, DOS, departmental systems, different vendors. At least with Unix, there is some sense of bringing those systems together. It should be a big help."

And Unix may just be the horse that got out before the barn door was closed, regardless of IBM's intentions. "There are a lot of people early on who expected Unix to go away because they figured the single-user multitasking networked workstation would make the need for Unix evaporate," stated Ursino. "The problem is that it has taken so long for those kinds of workstations to develop — and they are still not here — that Unix has gained critical mass."

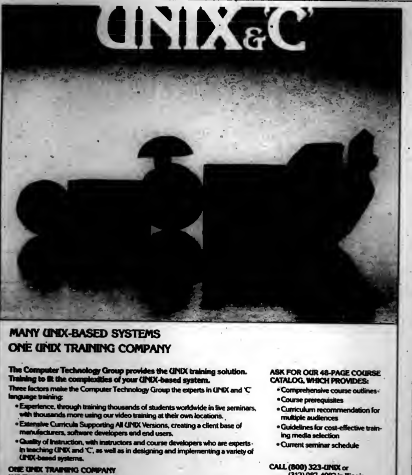
Whether IBM can break up that critical mass now seems to be a moot point. Kutnick insisted that Unix will make it or not based on its merits as an operating system.

He warned, however, that as more and more layers of complexity are added onto Unix, people will discover Unix isn't much better than any other operating system.

"I don't see commercial end users jumping up and down on the Unix bandwagon," Kutnick declared. "They are looking for solutions, not operating systems.

"There are still not many solutions in the Unix environment. IBM will not kill Unix, but the presence of its own operating systems will effectively limit Unix' penetration in the commercial marketplace." ≣

Rifkin is senior editor at Computerworld Focus.



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Unix Comes In Many Flavors. It's All a Matter Of Taste.

By Michael Dubrall

To the uninitiated, Unix might be considered a standard. As a matter of fact, AT&T is spending millions of dollars trying to convince U.S. businesses that this is the case. "System V, From Now On Consider It Standard" pops out of advertisements in virtually all computer publications.

However, once past the ads and into a purchase decision, a DP manager is faced with a confusing assortment of "standard" Unix types — all different, some incompatible and all considered standard by some small or not so small segment of the computer market.

This cornucopia of Unix brands came about because of the unique history of Unix as a commercial product. In the mid-1970s, only universities and the Bell system were using Unix to any degree.

By the end of the decade, a demand for the operating system was building from start-up hardware companies looking to capitalize on what they correctly perceived as a growing consumer demand for standard software. Unfortunately, during the same period, AT&T had no idea of the potential popularity of Unix. (For that matter, neither did most of the rest of the world.)

Consequently, when Onyx Systems, Inc., Altos Computer Systems, Wicat Systems, Inc., Fortune Systems Corp. and some of the other frontrunners tried to purchase Unix from AT&T, Ma Bell didn't know what all the fuss was about. So, for $43,000, AT&T granted the hardware companies rights to resell Unix. Unfortunately, the Unix sold by AT&T to hardware vendors was not so much like a product as it was a concept for programmers, and AT&T refused to make any changes or even to support the product.

In order actually to sell Unix to end users, vast changes had to be made by someone — especially in the areas of record locking, file locking, user interfaces and demand paging. Small struggling hardware companies simply did not have the expertise to effect these changes and to support the product.

The vacuum that developed was filled by Unix resellers such as Unisoft Systems Corp., Microsoft Corp., Interactive Systems Corp. Human Computing Resources Corp., The Wollongong Group and so on. These resellers all had one thing in common: They were founded by programming wizards with futuristic views on the way Unix could be used by the computing industry. Most of these companies also had strong ties with Unix-oriented universities.

Now the stage was set for the beginning of this Tower of Babel. Each software house — and some of the hardware houses — made its own changes in Unix to make the operating system more commercial. AT&T, unaccustomed as it was to rapid changes, was horrified by the whole process. It disassociated its Unix from the other Unixes. The pretenders were not allowed to be sold under the Unix label. Thus appeared Xenix (Microsoft), Uniplus + (Unisoft Systems Corp.), Zeus (Zilog, Inc.) and so on and so on. Eventually, there were so many names that the industry began to refer to the whole thing as the "Unix market."

At about the same time, other software houses saw the potential in the Unix market. They decided they didn't need AT&T. They wrote their own operating systems, loosely based on the principles of Unix but without the hassle or expense of dealing directly with AT&T. In this category, brand names like Coherent (Mark Williams Co.), Idris (Whitesmiths Ltd.), Oasis (Phase One Systems, Inc.) and QNX (Quantum Software Systems, Inc.) appeared. All these vendors have had some degree of success in the Unix marketplace.

By the end of 1982, when divestiture was becoming more of a reality than a threat, someone at AT&T woke up to the commercial potential of Unix, both as a pull-through product for hardware and as a source of revenue. The strategic value of controlling an industry standard operating system was also an issue.

AT&T made some effort to standardize the Unix market, but its stubborn refusal to unbundle the product has only strengthened the position of Unix competitors, especially in the microcomputer marketplace. Unix is a large and powerful operating system. If you purchase it on floppies, you could have up to 25 of them to sort through, more than enough to fill the disk capacity of a microcomputer.

Most microcomputer users did not require the more than 200 utility programs that come with standard AT&T Unix. This market demanded something less. Because AT&T wouldn't sell an unbundled version of Unix, microcomputer manufacturers requiring Unix capabilities went to Microsoft for their micro Xenix, turned to one of the unlicensed products available, or adapted Unix to fit their needs. At present, 30 to 35 commercial versions exist in the Unix marketplace.

In a market as segmented as this one, everyone has his own idea about what is real Unix and what is a Unix look-alike. For the purposes of this article, a look-alike will be defined as any operating system that is not AT&T Unix but still advertises that it is Unix-compatible or otherwise tries to score points by claiming similarities between itself and AT&T Unix. It is unfortunate that this eliminates some otherwise interesting companies and operating systems in the multiuser market. The most publicized of these include the SI and Pick and Associates, Inc.'s Pick System.

The Unix look-alikes described in this article were chosen to illustrate the breadth of the market. A partial list of other Unix look-alikes can be found in Figure 1.

Royalties Paid to AT&T		No Royalties Paid to AT&T	
Auros	Auragen	Coherent	Mark Williams
CPIX	IBM	Cromix	Cromemco
Eunice	Wollongong	Idris	Whitesmith's
FOR:PRO	Fortune	Micronix	Morrow Designs
4.1 BSD	Berkeley	Oasis	Phase 1
4.2 BSD	Berkeley	OS-9	Gimix
Genix	National Semi	PNX	Perq
HP-UX	Hewlett-Packard	QNX	Quantum Software
IS/1, IS/3	Interactive Systems	Regulus	Alcyon
Onix	Onyx	Uni-Dol	SMC
OSX	Pyramid	Unos	Charles River Data Systems
PC/IX	IBM/Interactive		
Perpos	CCI		
PNX	Perq Systems		
Serix	CMI Corp.		
Sphinx	Data General		
Sysb	Plexus		
System III	AT&T		
System V	AT&T		
TNIX	Tektronix		
Ultrix	DEC		
Unidos	Unidos		
Uni Plus +	Unisoft		
Unisis	Codata		
Unity	HCR		
UTS	Amdahl		
Venix	Venturecom		
Version VII	AT&T		
VM/IX	IBM/Interactive		
Writers Workbench	AT&T		
Xenix	Microsoft		
Zeus	Zilog		

Figure 1. The Unix Market

Xenix
Microsoft Corp.
Bellevue, Wash.

Xenix is by far the most popular Unix look-alike on the market today. According to Kirsten Sanders, market analyst at Yates Ventures, a Unix-oriented research company, "About 50% to 60% of the Unix installed base in the U.S. is running Xenix, and the actual installed base will grow significantly next year because of the IBM Personal Computer AT and its clones, which will all be available with Xenix."

Xenix was developed out of AT&T's Unix Version 7 and was recently upgraded to System III. Microsoft remains noncommital about the prospect of upgrading Xenix 3.0 to Xenix 5.0 to match AT&T. Its success had been the result of two good marketing decisions by Microsoft and some far-sighted technical planning by Bill Gates and his associates.

The first of Microsoft's two marketing decisions was to sell Xenix only to the few hardware vendors with the potential to ship large numbers of Xenix to minimize support problems. In its second decision, Microsoft unbundled the product to cut down on system overhead and to reduce prices to users that did

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not require all the Unix utilities. Today, top hardware shippers like Tandy Corp. and Altos Computer Systems offer hardware running Xenix, and IBM soon will.

Technically, Microsoft has been moving Xenix and MS-DOS closer together in anticipation of the networking of the two operating systems. The new MS-DOS 2.00 includes tree-structured directories and device drivers modeled after Xenix, and both operating systems can reside on the same hard disk. Today, it is relatively easy to network several personal computers running MS-DOS with a Xenix file server, a strategy IBM will no doubt exploit with its upcoming PC AT.

4.1, 4.2 BSD
University of California at Berkeley
Berkeley, Calif.

A great many people will tell you that 4.1 BSD (which stands for Berkeley Software Distribution) is not a look-alike, that it is the Unix standard. To them, AT&T Unix is just a cheap imitation.

Because Unix was developed at Berkeley, the school has always been an influential force in the technical evolution of the operating system. During the 1970s, Berkeley programmers, led by wizard Bill Joy and AT&T techies, enhanced Unix more or less in tandem.

By 1980, however, Berkeley Unix parted company with AT&T System III. Berkeley programmers continued to optimize their Unix for development while AT&T was turning its attention to the commercial arena.

Today, 4.2 BSD has a very fast file system which allows fast processing of large I/O blocks without undue system overhead. It is reputed to have the best C-language compiler available, and 4.2 BSD comes with a great many more utilities than does AT&T Unix.

Many of the utilities written at Berkeley have been picked up by hardware manufacturers, including AT&T, for their own versions of Unix. Prime examples are Berkeley Termcap and vi, which are mostly standard among the different Unix types.

The developing computer-aided design and manufacturing area of the Unix market is dominated by 4.2 BSD. Sun Microsystems, Inc. with technical guidance from Bill Joy, promotes and sells Berkeley Unix. Ultrix, sold by Digital Equipment Corp., is also based on 4.2 BSD.

UTS (Universal Time Share)
Amdahl Corp.
Sunnyvale, Calif.

Many DP professionals don't yet realize it, but Unix is already available for mainframe computers supporting full-duplex Ascii terminals. The product, UTS, is a hybrid of AT&T's System V, largely rewritten to take advantage of the power of the Amdahl 5860 and 5870 computers.

Reportedly, this Unix runs 20 frames faster on Amdahl hardware than on the competing VAX-11/70 sold by DEC. This performance is enough to make AT&T seriously consider the certification of UTS as "the mainframe Unix."

What's more, jobs can be submitted from UTS to IBM's proprietary MVS operating system via high-speed communication lines or channel-to-channel adapters. The resulting information can then be transmitted back to UTS for storage or further processing.

The most interesting point about UTS is not its technical attributes, but rather the effect this product has had on IBM.

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The marketing strategy for UTS has been little short of brilliant. Amdahl made UTS available not only on its own hardware, but also on IBM hardware. Such was the demand for Unix in the IBM environment that dozens of 370s were soon outfitted with UTS.

This gave Amdahl a credible presence at major IBM customer installations. Imagine the surprise of IBM salespeople and service representatives when they encountered an Amdahl support person working on "their" machine in a previously all-IBM shop.

It is this situation, more than anything else, that has forced IBM to acknowledge the importance of Unix. IBM Unix became a foregone conclusion with the introduction of UTS and its acceptance by IBM customers.

With the introduction of UTS and its acceptance by IBM customers, IBM Unix became a foregone conclusion.

Venix
Venturcom, Inc.
Maynard, Mass.

Venix is one of a slew of Version 7 derivatives or compatibles that were modified specifically to run on microcomputers (others include FOR: PRO, Xenix, Coherent and Ultrix). Venix has kept up with Unix evolution, moving first to System III and then System V. Venturcom markets Venix as a full and licensed version of Unix.

Beginning in 1980, Venix has been sold primarily on DEC hardware. It is presently available on the entire 11/70 family, including the new PDP-11/73, and on the DEC Micro 11 and Professional. The Rainbow version of Venix will be available soon. Venix has also been ported to many computers powered by Intel Corp. 8086/8088 microprocessors, including the IBM Personal Computer XT and the AT&T 6300.

Venix is especially attractive for the scientific and research markets because of its real-time data acquisition capabilities. It allows for intensive data input without slowing the speed of the operating system or affecting the background processes.

QNX
Quantum Software Systems, Inc.
Ontario, Canada

Employees of Quantum Software go out of their way to point out that QNX is not a Unix derivative and is not controlled by AT&T. In fact, they even changed the name of the product (from Qunix) and repositioned QNX to create a QNX market, as opposed to a Unix market. Most analysts have yet to accept this concept.

Whatever the analysts think, QNX is successfully carving out a niche for itself as a multiuser, multitasking operating system for personal computers. QNX has been ported to most personal computers, including the IBM PC XT and PC AT.

The major selling features of QNX are its size and its price. The operating requires only 128K bytes of random access memory (RAM) to operate efficiently. A license for 10 users, including about 50 utility programs, costs only $650.

Quantum has recently reached an agreement with the Canadian Board of Education to supply QNX running on Canadian Icon personal computers. With hundreds of Canadian students learning to use QNX, future prospects for Quantum Software seem bright.

Oasis
Oasis Technology/
Phase One Systems, Inc.
Oakland, Calif.

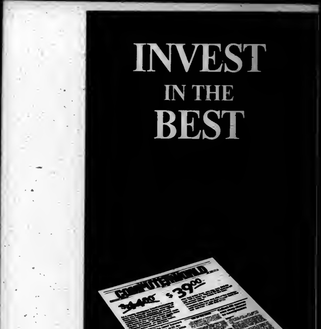
"Oasis is designed for business users using business applications in a business environment," Joel Laffittee of Oasis Technology said. This may sound a bit like an hyperbole, but ease of use is a major characteristic of Oasis.

This usability has attracted more than 200 software houses worldwide to provide applications for Oasis. The product has been adapted to make impressive inroads into the medical, dental, legal and other vertical markets. Almost a third of the installations are outside the U.S., mostly in Europe.

Oasis is not a derivative of Unix and does not generate royalty payments for AT&T. Instead, developer Tim Williams looked to the VM/CMS software offered for the IBM 370 for a model. The first pass was simply a control program, designed to sell the hardware on which it was running. When the customer showed more interest in the software than in the hardware, Williams turned the program into an operating system by 1978.

Oasis features English-like commands and is designed to be user-friendly from login to logoff. It is available for most computers with Intel microprocessors, including Tandy, Altos, Onyx and Seiko Instrument, Inc.

Dubrall is director of independent software marketing, Pacific Group, of NCR International, Inc.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There Is Software. Here's a Look At Word Processing.

By Joann Jackson

One of the most dynamic parts of the industry is the word processing software market; more WP packages have been sold for general office and home use than any other type of application software.

The growing acceptance of the Unix operating system from AT&T's Bell Laboratories has led to the introduction of new Unix-based systems by leading manufacturers: IBM, Hewlett-Packard Co., Digital Equipment Corp., NCR Corp., Tandy Corp., Burroughs Corp.and Honeywell, Inc. Other 16-bit and 32-bit manufacturers of multiuser systems — such as Altos Computer Systems, Inc., Fortune Systems Corp., Plexus Computer, Inc., Sun Microsystems, Inc. and Pyramid Technology Corp. — standardized on Unix from start-up. The bid by AT&T with its Unix-based processors for a large slice of the office systems market adds another dimension to the competition.

The growing number of existing hardware companies and new computer manufacturers offering Unix systems for general business use has created a high demand for application software.

A recent study, *Unix Word Processing Software: A Market Analysis*, by Yates Ventures, analyzed market growth potential and software suppliers. Vendor revenue from WP was a modest $6.5 million in 1983, representing sales of 12,000 packages in the U.S. The anticipated success of hardware companies selling and supporting Unix in the high-end multiuser business market has resulted in a forecast of 145,000 product sales and $65 million in vendor revenue from Unix WP software by 1987.

As of 1984, 28,500 units had been installed; top leaders were Fortune (29%), Tandy (22%), Quadratron (17%) and Horizon (13%). The three major distribution channels used by Unix software suppliers are hardware companies with independent software vendor programs, system integrators and software publishers.

Annual Unix hardware consumption (units actually installed at end-user sites) is forecasted at 341,000 units by 1987 (see Figure 1 on Page 50). Penetration ratios of Unix installations with WP will grow from 18% of hardware consumed in 1983 to 42% by 1987. The emergence of "all in one" packages with WP and other applications such as graphics, data base management systems (DBMS) and communications will have an impact on stand-alone sales of WP software shipments in the 1986/87 timeframe.

Current suppliers of stand-alone Unix WP packages consist of 13 independent software companies and three hardware manufacturers marketing proprietary packages. Market leaders in both units installed and sales revenue are two hardware companies: Fortune and Tandy. Fortune has achieved the highest penetration rate of hardware shipments with WP of any hardware company interviewed — 97% of its hardware shipments goes out with Fortune: Word or Extended Fortune: Word. Tandy's Scripsit 16 is not considered a viable commercial grade WP product by most competitors, but has achieved a high degree of sales in user installations of the TRS Model 16.

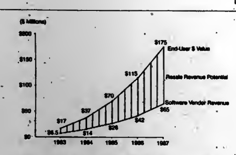

Figure 1. Unix Word Processing Software: U.S. revenue

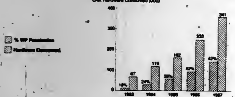

Figure 2. Unix WP Software Penetration Ratios, U.S.

Feature / Software Suppliers	Applied Technology Ventures	Computer Methods Corp.	Convergent Technology, Inc.	EEC Systems	Fortune Systems Corp.	Interactive Systems	Handle Technologies	Mark Software	Quadratron Software	RT Systems	Santa Cruz Operations	[illegible]	Syntactics	TYX Corp.	Tandy Corp.	Venturcom, Inc.
Spelling Dictionary		●		●	●		●	●	●	●		●	‡	●		
Ability to process WP documents created elsewhere		●	●	●	●				●	●	●	●	●		●	●
Screen-oriented	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Automatic generation of footnotes	‡	●		●	●	●	●	‡	●	●	‡			●		●
Indexes	‡	●		●	●		‡	‡	●		‡	●	‡	●		●
Table of contents	●	●		●	●		●	‡	●	●	‡	●	‡			
Mail merge	●	●	●	●	●		●	●	●	●	●	●	‡	●	●	
Columnar math	●	●		●	●		●	‡	●	●		●		●	●	
Calculator operations	●			●	●		●		●	●		●		●		
Saved phrase library		●	●	●	●	●	●	●	●	●	●	●	‡	●	●	
Macros		●		●	●	●		‡	●		●	●	●	●	●	
Menu suppression		●		●	●			●	●	●	●		●		●	●
Windows: split screen			●	●	●				●		‡			●		●
Multiple files			●	●	●	●	●		●		‡			●		
Sorting	●	●		●			●	‡	●	●		●	‡	●		
Display Greek symbols		●	●	●				●	●	‡	●	‡		●		●
Display scientific symbols		●	●	●			●	●	●	‡	●	‡		●		
Foreign language		●	●	●	●			●	●	●	●	‡		●		
Interface with: stand-alone word processors			●	●					●	●			●	●		
Graphic printers		●	●	●			●		●		●			●		●
Multifont capability		●	●	●			●	●			●	●		●	●	●
Multiple printers	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●

● Companies interviewed indicated these features were available. Yates Ventures and *Computerworld Focus* cannot, however, guarantee their existence or functional capabilities.
‡ Planned feature

Figure 3. Available Features

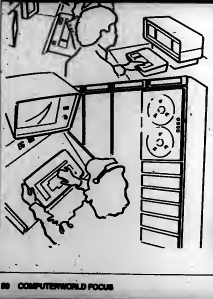

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Figure 4. Hardware Availability

Computer Methods, the first independent software company to introduce a Unix WP package, achieved early success by selling to the government and international marketplace (it has the only Unix WP package that meets government specifications). Worldwide sales of XED would rank Computer Methods first among the independents in both sales and units installed in 1984. Quadratron, formed in 1983, has been the most successful marketer of the independents. By signing ISV licensing agreements with numerous hardware companies, Quadratron grabbed a 17% market share of unit installations and 8% of vendor revenue during its first year.

Horizon Software, with 13% of unit shipments and 3% of sales in 1984, has dropped its stand-alone WP package and is now concentrating on selling an all-in-one package for WP and spreadsheets. Due to higher pricing of WP products on minis, Mark Software achieved a 6% market share in vendor revenue by selling to DEC VAX and Pyramid installations.

To ensure success and acceptance in a sophisticated buyers market, most developers of Unix WP have incorporated a number of feature enhancements in their products. Spelling dictionaries, macros, menu suppression, saved-phrase libraries, automatic generation of indexes and table of contents and mail/merge capabilities are commonly found. Some of the more advanced features — calculator operations, columnar math, windows, sorting and displaying Greek and scientific symbols — are also found on some products.

Software pricing set by most companies depends more on machine size than on feature availability. End-user prices ranged from $495 on a Motorola/Four-Phase system to $8,900 for a high-end DEC VAX. Considering the products are all sold on multiuser systems, the average cost per workstation was generally under $100.

The availability of WP products on Unix hardware is becoming less of a problem. Most software companies offer versions for several manufacturers' systems or are working on new ports. Users have a choice of a number of products for NCR, DEC, Plexus, Altos, IBM PC XT and Intel systems. Product availability for AT&T's systems will improve by early 1985 as several new products are released.

Paralleling the success of PC products like 1-2-3, several Unix software companies have opted to develop "all-in-one" packages for the general business market. Users wanting WP, spreadsheets, graphics and other integrated applications can choose from several products:

- Alis (Applix): WP, spreadsheet, graphics, list management, calendar management and communications.
- Latitude (Horizon Software): WP and spreadsheet.
- Officeware (Century Business Technologies): WP, DBMS, graphics, spreadsheet, calendar and phone directory.
- Prevail (Inspiration Systems): WP, DBMS, spreadsheet, application development language, report writer and telecommunications.
- Uniplex II (Uniplex Integration Systems): WP, DBMS, forms generator, spreadsheet and phone directory.

Jackson is a senior analyst with Yates Ventures, Inc. in Los Altos, Calif.

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Existing networks aren't going to go away just because we hope for standards.

[illegible]

BILL JOY

Bill Joy, 30, has probably had more influence over the current direction of the Unix operating system than anyone not affiliated with AT&T or Microsoft Corp. Joy is credited with creating the 4.2 Berkeley Software Distribution (4.2 BSD) version of Unix, the version used most prevalently on minicomputers in high-tech firms and in universities. His vision has helped bring Unix out from under the programmer's mantle to a more user-oriented focus. Joy helped found Sun Microsystems, Inc., where he is vice-president for research and development and is continuing his work with Unix in Sun's laboratories. Joy recently met with Computerworld Focus Senior Editor Glenn Rifkin to talk about his work.

[illegible] rather than [illegible] to operate in that [illegible] considerations.

[illegible] Unix approach [illegible] networking?

[illegible] now not [illegible] a new way of [illegible] with 4.2 we [illegible] these systems [illegible] the network protocol to provide a [illegible]

[illegible] 4.2 has a [illegible] with protocols as long as they [illegible]

In the [illegible] at all?

Ultimately, the most important things are the [illegible] and the application programs. The operating system is important because [illegible]

[illegible] I think operating systems will become less important, only because other things are becoming more important.

Like user interfaces?

One of the revolutionary things about the Apple Macintosh is not that it can have a mouse and the IBM PC cannot. The revolutionary thing is that the Mac provides a [illegible] way of using the mouse [illegible] you don't have to re- [illegible] use it each time you [illegible] in a different ap- [illegible] set of [illegible] fairly [illegible]. The [illegible] there's not a high [illegible] level that everyone can go to and easily add applications to. That's the nice thing Unix provides — a level at which [illegible]

[illegible] question. The [illegible] transition from [illegible] to bit-mapped and graphics [illegible] and products like [illegible] you can have bit-mapped on almost every machine. Perhaps the most creative people will go in and work on a bit-mapped sort of environment. The focus is at the application level. I'm not sure those kinds of things will emerge at the Unix command level, not for the problem of document preparation. If you take a view that the procedures and communications in an organization have to be defined in a new way that is appropriate to the office medium, then that gives you more of a chance of using the power of Unix.

What does the Fortune 500 MIS manager need to know about Unix for that environment?

What you're going to see in your environment over the next couple of years is a number of different machines with a range of computing power. In looking at the kind of software IBM has to offer, you notice there are different operating systems running on all the machines. So you don't have a clean migration of programs between machines of different sizes. They can communicate through some fairly complicated protocols, but not in a very convenient way. And with things getting cheaper so quickly and people getting more connected — for example, the MIS department is going to be connected with the engineering department — Unix can be used as vehicle for people to communicate with each other.

The people who know about state-of-the-art stuff coming out of the universities are trained in Unix. I think you'll see Unix boxes running a lot more sophisticated data analysis model programs for corporate management — programs that are too big to run on personal computers.

Some consultants say Unix will be a nonissue in two years, and that it's overrated for the commercial market.

The kinds of applications we see running on microcomputers today are incredibly primitive. They barely scratch the surface in what you can do to make people more productive. They are typically very clumsy and slow. But people tend to not be very critical of them because these applications are so much better than the ones people had before. Take a process that is incredibly inefficient and switch it to a microcomputer. It's already a helluva lot better. But there's so much room for improvement — for making things more productive — that you're going to see new generations of software.

Take some of the office software you see on a Wang or IBM PC. We could show you a document preparation system that runs on a Unix-based Sun and an information management system that runs on a network of Suns. They're so much better that you have to think of them as a different generation.

It's almost indescribable. It's realtime; it's formatted. It's state of the art in document preparation, and it's basically five to 10 years of research ahead of the people who did the word processors.

Unix has been criticized in the micro

Joy in Unixville

Though Unix was created in Bell Laboratories in New Jersey, the University of California at Berkeley became a hotbed for Unix development in the 1970s.

Most influential in Berkeley's Unix effort was a young computer science graduate student named Bill Joy, who came to the campus in 1975 from his native Michigan. Joy and his colleagues got deeply involved with Unix almost immediately, creating enhancements for Version 6 to meet certain educational needs. Joy spearheaded the early releases — BSD and 2 BSD — which were sold for $150 to hundreds of universities and research labs. He also added Pascal and several other capabilities for use of Unix on Digital Equipment Corp.'s PDP-11s.

In late 1978, Berkeley was one of the first to acquire DEC's new and powerful VAX supermini, along with an early release of Unix for the VAX from Bell Labs. For Joy, that signaled the opportunity to get to the heart of Unix.

Among Joy's considerable contributions was his creation of the C shell command interpreter, the vi screen editor and the Berkeley paging kernel.

It was at that time that Darpa, the Defense Department's Advanced Research Projects Agency, was wrestling with the decision of whether to switch to Unix as the base for its research.

Darpa went with Unix and in 1981 gave a contract to Joy's Berkeley group. By mid-1982, a community of research people from such places as Stanford and Carnegie-Mellon universities, University of Southern California as well as Bolt Beranek & Newman, Inc. (BBN) got together at Berkeley, and a new version of Unix — designated 4.2 BSD, emerged.

Joy himself wrote the design documents and created the virtual memory enhancement for 4.2. Kirk McKusick added the high-performance file system, and Sam Leffler added the networking capabilities. The actual code for 4.2 came from BBN. Joy is quick to point out, however, that the design was a joint effort that made use of a lot of varied resources from different installed bases.

After his success with 4.2, Joy left Berkeley, having completed a master's degree in electrical engineering and computer science. Before finishing his Ph.D., Joy was recruited by Scott McNealy to co-found Sun Microsystems, Inc., a manufacturer of Unix-based high-performance workstations for the technical marketplace. He continued to consult with the Berkeley group until July 1984.

Despite his entrance into the business world, Joy has not abandoned his idealistic pursuit of science. As vice-president of research and development, he essentially spends his time getting major development work started, but he is also down in the trenches getting his hands dirty. He has, he feels, created an ideal environment for his inventive and searching psyche. "I don't report to anyone and nobody reports to me," he said, smiling.

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environment as not being friendly enough. Do you agree?

Unix' value is not in its current set of application programs. As a program development environment, it's probably the best. As an end-user tool, you're going to see a little more closed environment. There are already products people have created for doing a specific function where you sit down in front of the machine and that's the environment you're in. They particularize the interface to those application areas.

Are these specific programs based on the 4.2 enhancements?

The applications will probably run on any version of Unix. But a lot of them are taking advantage of facilities in 4.2 to manage bit maps and concurrency and especially to use the network to support them.

Not many commercial installations are using 4.2. Why?

They may not be using the enhancements because they're not using Unix. Until a year or two ago, the primary delivery vehicle for Unix was the VAX. Almost all the universities, labs and engineering companies running Unix on the VAX used the Berkeley release because it was most suitable. System V is important if it can deliver a large range of applications programs across a wide range of machines.

The other thing to notice is that applications are market-oriented, not machine-oriented. You can't really expect all applications to have the same needs; it's not unthinkable that one version of Unix exists for the most advanced environment and another version for an environment where the cost issue prevents using the more expensive micros and a lot more memory.

What is your involvement in any further work on 4.2?

There's not going to be that much change to the system interface in the future. We did a fairly good job of getting it right. Mostly what's being done is implementation; we're running a lot more code to implement things that are already in the design.

But 4.2 is a very stable system; you won't see the amount of change in 4.2 over the next few years that you'll see in System V or in MS-DOS. MS-DOS changes fairly regularly because a lot is missing.

What is your projection for Unix and the marketplace five years down the road?

You can see five years from now what kind of machines will be available. A nicely configured Sun costs $20,000 today. In 1990, it will cost a quarter of that. You'll see well-integrated software working in an environment where machines communicate information with each other. We'll see systems that are more customer-programmable, and languages in that environment for people who aren't experts at programming. We'll also see the integration of a lot of the software used today on research systems. You won't find anything in widespread use that isn't already out there today in a research prototype.

Unix is probably going to be code in read-only memory that glues you into the network environment and just lets you run all these applications programs, whether you run Smalltalk, Prolog or All-In-One. You should be able to run all those things concurrently. The best way to think of Unix is as a sophisticated virtual machine. It'll be around for a long time.

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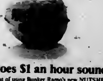

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RON CHIRONNA

What's The Prognosis For Unix In the Office?

By John Butler

Unix has been widely discussed as a potential supporting operating system for tomorrow's office automation systems. Advantages such as transportability, ability to support communications and multitasking capabilities must be weighed against Unix' disadvantages, including its somewhat difficult-to-use interface.

Before the pros and cons of using Unix in the OA environment can be accurately assessed, it is necessary to lay some groundwork. What characteristics should an advanced office system have? What demands will such a system place on an operating system?

Two different classes of software are used in office applications today: integrated personal computer software and integrated office automation systems. Although each calls itself integrated, each lacks the important integration capabilities of the other.

Integrated personal computer software has pioneered in the area of analytical applications for professionals, such as spreadsheet and graphics. High-quality word processing software has also become available for personal computers recently. In addition, the user interfaces to these applications have become fairly well integrated in the better systems.

However, personal computers usually lack facilities for sophisticated communications because these machines were originally aimed at the individual user. Microsoft Corp.'s MS-DOS's lack of multitasking is one prominent example of this situation.

Some form of multitasking is a practical requirement for monitoring a local-area network while also permitting application processing. For this reason, integrated personal computer software does not typically offer application solutions that take advantage of communications. "Every man is an island" is the assumption of most personal computer software; every user has his own data and works as an individual.

A next-generation office system should combine the analytical, problem-solving capabilities of personal computer software and the information-sharing and communications benefits of OA software.

In contrast, studies that have been done of office workers show that most professionals, especially managers, spend the largest portion of their time communicating, coordinating and trying to "work as a team." Personal computers therefore need to be integrated with the fundamental communications systems of the office.

The other class of office application software, integrated OA systems, has excelled in office communications solutions. This software typically arose out of a combination of traditional WP and traditional interactive minicomputer technology.

Convenient electronic mail and messaging applications, group information-sharing capabilities, shared resource and calendar scheduling and shared administrative support applications have been added to a WP base. The multiuser, multitasking facilities of typical minicomputer operating systems have been the basis for these capabilities. Again, the user interface is integrated across applications in the better systems.

In the areas of analytical support applications and user interface technology, however, this class of software has not kept up with integrated personal computer software. Spreadsheets are generally weaker than those available from independent software suppliers for personal computers, and graphics are often poorly integrated with the rest of the applications.

A final point is that much of this office automation software does not make effective, flexible use of the distributed computing capabilities of workstations or personal computers. It frequently requires that a shared minicomputer act as a hub, an architecture derived from the timesharing era of interactive computing.

Both personal computer and OA software meet important needs of the office. Each has strengths where the other has weaknesses; each is integrated where the other is not.

A next-generation office system should combine the strengths of these two classes of software — the analytical, problem-solving capabilities of personal computer software and the information-sharing and communications benefits of OA software.

This office system should be able to exploit the potential of the new generation of workstations, such as the IBM Personal Computer AT. But it should also be able to use departmentally shared machines.

For example, one end-user establishment may be dominated by users at terminals on shared servers with just a few users at workstation nodes; another may be mostly workstation nodes with few or no users of shared servers as application processors.

Furthermore, communicating nodes could be linked by a local-area network, a private branch exchange or a common carrier-based network.

The user, in any case, should perceive exactly the same information sharing and logical communications capabilities.

An advanced office system should also provide a consistent and easy-to-use multiwindow interface. These communications and multiwindow capabilities make multitasking a practical requirement.

The ability to mix different types of information such as text, spreadsheet,

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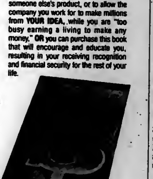

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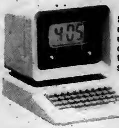

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business graphics and data base in a single document is desirable. An advanced system should allow users to combine all types of information in a single document and to edit them in their native way.

On technical grounds, many proprietary operating systems would be adequate foundations for an advanced office system. Their technical disadvantage is that they have grown too large for use on cost-effective microprocessor-based systems.

For example, such an advanced system would permit a user to add diagrams to illustrate what is being said in words. This capability would allow the user to see the entire document taking shape at once, knowing it would be easy to come back and edit any part later.

Advanced systems should have an open architecture to support a document-based integration of information types; to provide a consistent, overall information management setting; to support network-based communications; to be modular and facilitate portability and customization; and to support future display requirements of information types such as digitized voice or scanned images.

These are the characteristics an advanced office system should have. What are the available operating system alternatives upon which such an office system might be built?

Operating systems can be divided into two groups — proprietary operating systems and licensed transportable operating systems. Proprietary systems run on only one brand of equipment. This situation exists either through design — for example, because the systems have been written in assembler — or through the business policy of the owners of the systems — for example, VMS for Digital Equipment Corp.'s VAX machines.

In contrast, transportable operating systems are made widely available by their owners. This is facilitated, as in the case of Unix, by their being written entirely in a high-level language. MS-DOS and CPM are other examples of transportable operating systems.

Many proprietary operating systems would on technical grounds be adequate foundations for an advanced office system.

Although all operating systems reflect technical tradeoffs and none is perfect for OA, many of the popular minicomputer operating systems, such as VAX VMS or AOS/VS, are reasonable technical bases. Such systems offer the desired multiuser, multitasking capability. They can respond to terminal I/O on a character-by-character basis and they also lend themselves to easy process creation and peer-to-peer networking capabilities. These characteristics also apply to Unix. In many cases, the technical disadvantage of the proprietary systems is that they have grown too large for use on cost-effective microprocessor-based systems.

Other proprietary operating systems pose technical impediments to OA applications. Typical mainframe operating systems, such as DOS/VSE and MVS, fall into this group. Because of their batch origins, process creation tends to be too costly in terms of computing resources, and terminal I/O is block-mode, oriented toward transaction processing. The former limitation makes it impossible to devote multiple processes to a single user, as is desirable in handling documents that mix graphics, text and voice, for example. The block-type I/O makes visually responsive office applications such as WP very difficult.

Apart from the technical pluses and minuses, however, the single largest deficiency of all proprietary systems is that, by their nature, they are limited to a single brand or type of equipment.

In contrast, end users can realize three distinct benefits through the widespread use of transportable rather than proprietary operating systems for OA.

- The lack of an office system that can run on a wide range of hardware such as IBM Personal Computers, DEC VAX machines and IBM 4300 systems is a major problem today. This situation has spawned attempts to glue the differing office systems together with document format converters of various kinds. At best, this results in a feeble integration that greatly reduces the communications

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capabilities for which office systems are bought.

Contrast this with the use of a transportable operating system, which provides a common foundation upon which a unified office automation system can exist. Without that common foundation, the task of porting an office system to all the different proprietary operating systems becomes almost impossible. With a transportable operating system, a single organization can choose from a variety of hardware vendors, yet still be able to run a single operating system and office system.

A common operating system spanning a wide range of office hardware represents a large market base for application software. This large market base in turn stimulates independent software development, resulting in a wider selection and higher quality of software for the end user. An example of this trend can be found in the abundance of software provided for MS-DOS after it emerged as the standard operating system of 16-bit personal computers.

With a standard operating system and an OA system tied to it (and not to the underlying hardware), the end user is free to price-shop for hardware among a variety of vendors. This tends to lower hardware prices, even for those who consistently choose one or a limited number of brands.

The inherent advantages of transportable operating systems would not be sufficient to overcome the desire of many hardware vendors to continue to promote proprietary operating systems, were it not for the powerful pressure applied by high-volume, high-performance microprocessors.

Contemporary chip sets such as the Intel Corp. 80286 family and the Motorola, Inc. 68000 family offer for low- to mid-size processing loads computing economy unmatched by comparatively low-volume proprietary computer architectures. Yet, these chips typically were introduced into the industry without proprietary operating systems.

As a result of this situation, many manufacturers eager to exploit the potential of these chips have turned to transportable operating systems such as MS-DOS and Unix.

Given the end-user advantages and the microprocessor technology pressures, a move toward far greater use of transportable operating systems as a basis for OA is likely, and the serious contenders are MS-DOS and Unix.

Two questions follow: Which, if either, will win? How soon will this happen?

MS-DOS' main advantages are its large installed base among personal computers and its large body of accepted application software. Its major liability is that it is a single-user, single-tasking operating system; this liability is reflected in the general lack of well-integrated office communications capabilities in its applications.

Studies of how office workers use their time show that they spend the largest percentage communicating, particularly among higher paid office professionals and managers.

To increase office efficiency, OA systems must significantly improve communication. Work-group-oriented applications such as electronic mail, electronic shared filing, group-based project management and electronic meeting scheduling are needed in addition to the personal/analytical applications of today's personal computer software.

These work-group applications require effective local communications networks and, when used in conjunction with other types of applications, require a multitasking operating system within each single-user workstation. For example, it must be possible for you to receive mail or for your secretary to check your calendar without interruption to your work on a spreadsheet.

Today, MS-DOS lacks the multitasking capability needed to do this, even though the hardware capability is there with the new IBM Personal Computer AT.

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The potential application performance of the IBM PC AT is clearly underserved by a single-tasking operating system.

This is true in general for a range of 32-bit AT-like workstations we can expect to see from a variety of manufacturers. In this regard, MS-DOS has not kept pace with the hardware. Microsoft Corp. has been promising a multitasking capability for MS-DOS for some time. Even if this capability materializes, this may not be the long-term winner against Unix for two reasons:

1. To retain its leadership position for the new generation of 32-bit workstations, MS-DOS would need IBM's endorsement of its promised multitasking capabilities. By providing a multitasking capability incorporated within its Topview proprietary windowing package, IBM has gone down a separate path for putting multitasking into MS-DOS.

It seems unlikely that, having chosen this route, IBM will subsequently endorse Microsoft's multitasking MS-DOS.

The prospect for a transportable, multitasking MS-DOS supported by IBM seems low. This fact, combined with the lack of graphics support in Topview, may retard acceptance of MS-DOS in advanced office applications requiring multitasking.

2. Even if provided with multitasking capability, MS-DOS will remain unsuitable for use on larger multiuser systems in the departmental server class. Local nets consisting of some workstations and some multiuser systems would have to use different operating systems for the two classes of machines.

By contrast, with Unix on the workstations as well as the multiuser systems, a homogeneous network can be constructed, which greatly simplifies information sharing and communications.

Despite these technical advantages, Unix does have some well-known shortcomings. Among the more serious ones is the unreliability of its file system. Not originally intended for commercial use, its design leaves the user vulnerable to data losses. One would hope for a general solution from AT&T.

Overall, Unix enjoys technical advantages, and MS-DOS has the momentum of the installed base.

Unix' user interface is cryptic and unforgiving, but this is a less-serious problem. An advanced office system would have to provide its own user interface regardless of which of these popular operating system was to be used.

Thirty-two-bit workstations such as the IBM PC AT offer the performance power to support the concurrent application processing and local net communications needed for advanced office applications. Whether Unix or multitasking MS-DOS will become the standard operating system for this class of system remains to be seen.

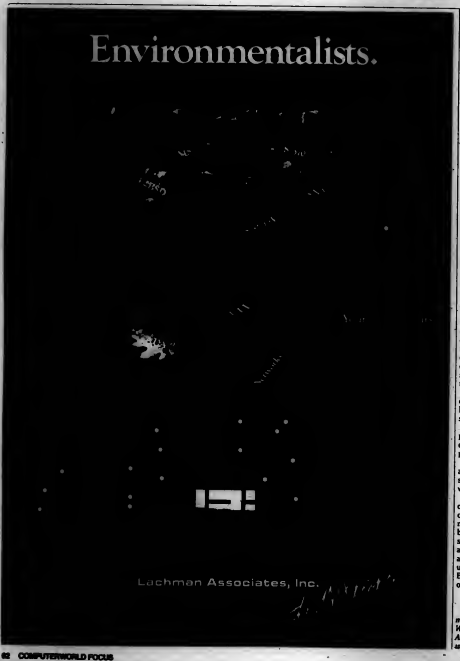
Overall, Unix enjoys technical advantages, and MS-DOS has the momentum of the installed base.

If Topview gains strong support among application developers, Topview/MS-DOS will probably dominate.

If Unix makes early gains in advanced network-based office systems, the world may move toward Unix.

How soon will the answer become clear? Several integrated office systems for Unix were announced in 1984 and are now beginning to ship. Topview is scheduled for first quarter 1985 and Microsoft's multitasking and MS-Windows is now scheduled only for sometime in 1985. By this time next year, the shape of the answer should be clear. ≣

Butler is vice-president of marketing at Applix, Inc. in Westboro, Mass., a supplier of Alis, a Unix-based office software system.



Q&A

(Continued from Page 6)

Yes, I think so. I think price/performance-wise Unix is a helluva bargain. I'm a bit disappointed in the way the market has developed, especially in the personal computer area. It's been developed more to meet the requirements of a couple of vendors than to meet the requirements of the user community.

Hasn't there been some question about the portability of Unix?

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But there isn't anybody running MS-DOS on a 68000. If you happen to have a 68000, you don't have to worry about porting Lotus 1-2-3 to it because there ain't no way it's ever going to go on it.

I'm not being a pitch man for AT&T, but I'd like to get some of the facts out on the table..Unix is a good system, and it's been undersold by those in a position to sell it and denigrated by those in a position to benefit by denigrating it. ☰

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Manager's Corner

Who Manages End-User Computing?

By Philip J. Pyburn and Michael E. Lawson

A recent survey estimated that as much as 80% of the computing in 1990 will be carried out directly by end users, and much of it will be personal computer-based. The personal computer has already changed the way many firms create and deliver computer-based systems. Formerly extensive background and skill were needed to create even the simplest applications, but today most managers and professionals can design, program and operate their own systems using personal computers and a wide range of available software.

Just because managers and professionals can create and operate their own systems, however, does not mean they always should. It is clear to most managers that some applications are inappropriate candidates for user development on the personal computer, either because of their size or because of their importance to the firm. Other applications, though, that perform analyses the user would have carried out manually anyway seem like good targets for personal computer use.

Who decides whether an application should be developed for the personal computer? And, if it is to be developed, when, where and how should it be designed, programmed and used? In many firms, the senior information systems executive is charged with answering these questions, and some are becoming concerned that planning and control for the personal computer are incomplete or inappropriate for the problem. This concern does not mean they view all personal computer use as wrong, but only that they fear serious long-run problems caused by unplanned and uncontrolled use.

But planning and managing end-user computing can be a very difficult undertaking. Beyond the low cost of the personal computer itself, the motivations for purchasing a personal computer include the slow response to development requests by the central information systems department and the control that a stand-alone unit offers. On the other hand, some recent research indicates that the majority of personal computer users would use a shared machine if it could provide the same level of operational performance and availability. The problem, then, is management's inability to effectively plan and produce required information systems and to control the criteria by which "appropriate" applications are selected.

As a first pass at the problem, it seems reasonable to suspect that the use and management of personal computers will follow an evolutionary path similar to that of other information technologies. Early on, a few personal computers will creep into the organization with little planning or control, in situations where support is mostly users helping users. Next, a substantial increase in the number of micros will be evident. Still, standards will be few, and control will be provided primarily by users. Support will probably be provided by informal organizations operating as an underground. Lack of planning will begin to be noticed.

The third stage can be characterized by the first steps toward integrating the personal computers into the overall computing environment. Planning will take on a short-range, detailed nature especially geared toward system configuration and data requirements. In this transition phase, it is especially important to develop centralized standards and controls if full integration and system compatibility are to occur.

It is also in this stage that the intro-

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Products

BLUE BELL, Pa. — **Sperry Corp.'s Information Systems** unveiled its 5000 series of microcomputers supporting Unix System V and up to 64 users and introduced the 7000/40, a 32-bit minicomputer running Berkeley 4.2.

The 5000 series features the 68000 microprocessor and offers a performance range of 0.7 Mips to 3.2 Mips. The 5000/20 and 5000/40 use 5.25-in. floppy or fixed disks, the 5000/60 uses 8-in. fixed disks and the 5000/80 uses 8-in. or 10.5-in. fixed disks. The products range in memory from 1K bytes to 16K bytes and in price from $15,000 to $150,000. The 7000/40 comes with 4M to 8M bytes of main memory and supports up to 128 users. According to Sperry, the CPU performance of the 7000/40 is 7.7 times than that of Digital Equipment Corp.'s VAX 11/780. It is priced from $160,000 to $300,000 and will be available midyear.

Sperry also announced Q-Office, an integrated office automation software package for the 5000 series priced from $3,500 to $20,000, and the Manufacturing Business Solution software package, an on-line manufacturing control system running on Unix systems. It is priced at $50,000 to $300,000 from Sperry Information Systems, P.O. Box 500, Blue Bell, Pa. 19424.

BELMONT, Calif. — **Fortune Systems Corp.** unveiled an intelligent workstation line that operates in both Unix and PC-DOS environments. The Fortune 1000 family is aimed to work in conjunction with Fortune's 32:16 microcomputer and can be configured to link IBM Personal Computers and Fortune products.

A low-end configuration including monochrome graphics terminal, system unit, MS-DOS software and Fortune terminal emulation software costs $2,995. A system configured with a system unit with 68010 Unix card, one floppy disk, a 10M-byte hard disk and the For-Pro operating system is priced at $7,085 from Fortune Systems Corp., 101 Twin Dolphin Drive, Redwood City, Calif. 94065.

DALLAS — **Lantech Systems, Inc.** announced Unetix 2.0, a multitasking Unix-compatible operating system for the IBM Personal Computer, Personal Computer XT and compatibles.

Designed for stand-alone workstations, the $129 hard-disk software product supports the Lantech Integrated/Office (I/O) office automation software series. The I/O series allows users to mix and match programs such as the $50 Powerlink 100, an asynchronous communications program connecting IBM Personal Computers to any host supporting a VT100 terminal, a $100 integration facility enabling users to transfer data from a mainframe into a local application, a $120 windows facility, a $50 PC-DOS emulator and a $200 C compiler from Lantech Systems, Inc.

More information is available from Lantech, 5501 LBJ Freeway, Suite 500, Dallas, Texas 75240.

Manager's Corner

duction center appears to be most profitable. This third stage is likely to be the most difficult to manage and, perhaps, the stage most sensitive to changing technology.

The fourth stage is characterized by a fully developed end-user computing environment. It would include detailed long-range plans spelling out specific responsibilities for the information systems department, functional managers and users. Maintenance of standards and control would be easier to manage because of the broadly based existing systems and because of the standardizations imposed in the third phase. Finally, support would be very diffused throughout the organization.

These phases will likely be concomitant with the evolution of application programs being developed and used. In the early stages, programs and application will tend to be of a personal nature. Loose control of these programs will be provided by functional managers, and reactive help and training is appropriate. As the application becomes useful to departments, planning and control functions must increase. In particular, questions of the role of micros vs. other technologies, configuration architecture, application architecture and data requirements must be addressed. Also, documentation, security and design standards increase in importance. Finally, proactive consulting and education must be provided centrally. When applications are to be used by the organization as a whole, the full capability of the information systems department must be brought to bear. Full planning cycles, together with very explicit standards, are fundamental requirements.. The information systems department must maintain control of these activities and be responsible for providing support.

Pyburn is director of the Information Systems Research Center, and Lawson is director of the Masters Program in Management Information Systems at Boston University's School of Management.

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Products

WESTBORO, Mass.— **Data General Corp.** introduced a range of software for DG/UX, its native Unix operating system, including Documenter's Workbench, a word processing and text formatting system, and Pascal and RM/Cobol programming languages.

Through RM/Cobol, users will have access to more than 1,500 applications packages, DG said. The Pascal programming language for DG/UX is based on Niklaus Wirth's Pascal, which is a high-level structured programming language. DG/UX Pascal has a common code generator and shares the same optimizer as DG/UX C and Fortran 77 for DG/UX. It will cost $4,910. RM/Cobol from Ryan-McFarland Corp. is a GSA-certified version of the Ansi 74 Cobol standard. Prices are expected to start at $1,500.

DG also announced that it is supporting Transmission Control Protocol/Internet Protocol under its AOS/VS operating system for a price of $2,000. This makes DG the first major computer vendor to support this industry-standard network for both a native Unix and a proprietary operating system over an IEEE 802.3 local-area network, the vendor claimed. DG is at 4400 Computer Drive, Westboro, Mass. 01580.

ROCHESTER, N.Y. — **Computer Consoles, Inc.** introduced its first personal computer which is reportedly both hardware- and software-compatible with the IBM Personal Computer and integrated with the firm's Unix-based Officepower system. The CCI PC, running the MS-DOS 2.11 operating system, comes with an Officepower terminal emulation package that allows the micro to operate as a fully supported Officepower terminal, the vendor said.

A base system, configured with a monochrome display, floppy disk drive, 256K-byte random-access memory and Powerterminal software costs $2,500. A high-end configuration including a 10M-byte fixed disk drive and color display is priced at $5,800 from Computer Consoles, Inc., 97 Humboldt St., Rochester, N.Y. 14609.

PALO ALTO, Calif. — **Relational Database Systems, Inc.** unveiled an enhanced version of its relational data base management system, Informix 3.3.

The enhancements will be provided to Informix users being supported by the firm for the cost of shipping and handling, according to the vendor.

For more information, contact Relational Database Systems, Inc., Suite 600, 2471 E. Bayshore Road, Palo Alto, Calif. 94303.

MINNEAPOLIS, Minn. — **CPT Corp.** introduced enhancements to its Unix-based Office Dialog system allowing for the networking of up to 128 workstations. The CPT Open Connection I links microcomputers such as the IBM Personal Computer and any system capable of sending and receiving Ascii characters to the Office Dialog system. Open Connection I supports such applications as word processing and electronic mail and is priced at $2,000.

The $6,000 Open Connection 2 provides access to calendaring, data base management, Cobol and Basic languages and 3270 emulation in addition to the applications on Open Connection I.

The CPT Office Network links eight 16-user Office Dialog systems to create a network of up to 128 workstations for sharing resources. It is available for $2,000, from CPT Corp., 8100 Mitchell Road, P.O. Box 295, Minneapolis, Minn. 55440.

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Products

SAN ANTONIO, Texas — A 32-bit stand-alone computer system running a Unix-like operating system and supporting up to 28 users was unveiled by **Datapoint Corp.**

The Datapoint 3200 runs the Unos operating system (from Charles River Data Systems, Inc.) which supports the C programming language, RM/Cobol and Databus — the company's business programming language.

The 3200 features dual 68000 Motorola microprocessors, one with 4K bytes of cache memory performing applications processing, the other dedicated to I/O operations. The 3200 connects to the firm's ARC local-area network via the $2,500 INX-32 adaptor, an internal card and associated software.

An entry level system with 1M byte of memory, 32M bytes of disk storage with 1M byte of diskette storage, 4K bytes of cache memory, and four serial ports is priced at $15,430. The Unos license is priced at $1,000, from Datapoint Corp., 9725 Datapoint Drive, San Antonio, Texas 78284.

MOUNTAIN VIEW, Calif. — A dual-processor 32-bit superminicomputer was unveiled by **Pyramid Technology Corp.** The 90Mx runs the OSx operating system, a dual port version of Unix derived from System V and 4.2 BSD.

The 90Mx features up to 256 user ports and reportedly has a throughput 1.6 to 1.8 times that of the firm's 90x. An entry level 90Mx with a 415M-byte disk drive, 1600 bit/in. magnetic tape drive, 16 user ports and 4M bytes of main memory costs $220,000. For more information, contact Pyramid Technology Corp., 1295 Charleston Road, Mountain View, Calif. 94043.

OCEANPORT, N.J. — **Perkin-Elmer Corp.** introduced a 32-bit supermicrocomputer running Unisoft Systems Corp.'s Uniplus operating system.

The PE 7350A, based on the 68000 microprocessor, supports up to five users. The computer has expansion space for the PE Ethernet Data Link Controller board, which gives users access to the firm's Ethernet local-area network.

The 7350A, with 512K bytes of memory, four ports and 15M bytes of hard disk storage, costs $8,250. A multiuser system with 1M byte of memory and 28M bytes of hard disk storage is priced at $10,900, from Perkin Elmer-Corp., 2 Crescent Place, Oceanport, N.J. 07757.

SANTA CRUZ, Calif. — **The Santa Cruz Operation** (SCO) introduced a full line of Xenix business applications, including the Lyrix word processing system, gateways for 3270 mainframe communications and system support packages for add-on mass storage.

The Lyrix WP package, available for $595, runs on the IBM Personal Computer and Personal Computer XT; Apple Computer, Inc.'s Lisa 2; Tandy Corp.'s 1200 and 2000; and AT&T's 3B line. SCO also introduced the Unipath mainframe communications gateway that allows Xenix and other Unix systems to operate on IBM SNA and BSC networks without changing host software. The company also unveiled a driver software package that reportedly allows the addition of mass storage hard disks from several manufacturers to interface with IBM PCs, PC compatibles and Apple Lisas running Xenix. The drivers are priced from $150 up to $795 from SCO, 500 Chestnut St., P.O. Box 1900, Santa Cruz, Calif. 95061.

IRVINE, Calif. — **Alpha Microsystems, Inc.** has introduced AM-1100E, a desktop microcomputer that runs Alpha's Unimos multiuser operating system, which is capable of supporting 11

Insider

(Continued from Page 5)

pastime is tinkering. Thus a variety of Unix versions and derivatives exist — enough to frustrate any information systems planner. In the early 1980s, Version VII was rather different from versions from Berkeley, Livermore Labs or any of the private label Unix vendors. However, since the acceptance of enhancements such as virtual memory, demand paging and improved editors, as well as reasonable success with standard setting in User Group subcommittees, most fundamental differences in product are eroding. If the user intends to build rather than buy applications, the standards issue is further suppressed.

- IBM and most other major hardware vendors are unwilling participants in the Unix drama. From a competitive perspective, IBM has little to gain from widespread acceptance of Unix vs. PC/DOS, MVS/XA or any future distributed operating system. An operating system that has the potential to ease the pain of multiple vendor environments also has the potential to have an adverse effect on market share, not to mention causing an additional software research and development expense. For these reasons, IBM and hardware vendors in general will be found on the last float in the Unix parade.

Willmott is director of user research and services for International Data Corp. in Framingham, Mass.

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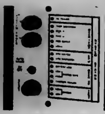

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Products

users. Unimos is a version of AT&T's Unix System V and supports Unix versions of programming languages like C, Cobol, Fortran and Basic, the vendor said.

The micro features a Motorola, Inc. 68010 microprocessor, 1M byte of random-access memory, a 30M-byte hard disk drive, three serial ports which are expandable to 11 ports and a 40M-byte streaming tape backup, according to the company. The AM-1100E costs $15,585 from Alpha Microsystems, 17332 Von Karman Ave., Irvine, Calif. 92714.

WELLESLEY, Mass. — **Pathway Design, Inc.**, which develops and markets an integrated family of data communications products that provides links between professional microcomputers and communications networks, has announced its Unipath product line.

Unipath is a micro-to-mainframe communications product operating under Unix Systems III and V. Unipath resides on the hard disk of a 32-bit supermicror system and permits concurrent communication for 32 devices with a variety of IBM hosts in SNA/SDLC and BSC network environments. Pricing for Unipath will be based on the number of sessions supported. One user, five sessions is $795; 16-session and 32-session versions cost $1,395 and $1,995, respectively, from Pathway Design, Inc., 177 Worcester St., Wellesley, Mass. 02181.

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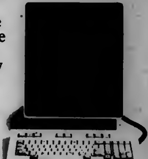

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